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CHAMBERS'S

ENCYCLOPÆDIA

A DICTIONARY

OF

UNIVERSAL KNOWLEDGE

NEW EDITION

VOL. V

FRIDAY TO HUMANITARIANS

WILLIAM & ROBERT CHAMBERS, LIMITED
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Among the more important articles in this Volume are the following:

Friendly Societies...	Rev. J. Frome Wilkinson.
Friends	James G. Smeal.
Fruit; Fungi	Professor Patrick Geddes.
Fuel	R. E. Anderson.
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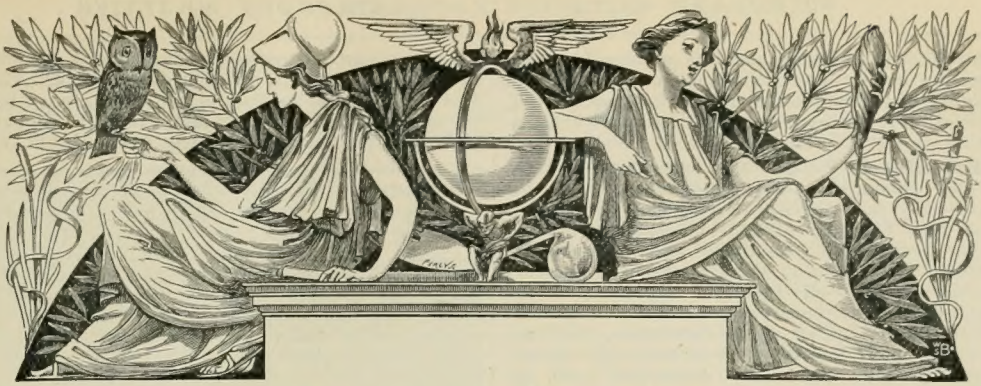

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Friday (Lat. *Dies Veneris*, Fr. *Vendredi*, Ger. *Freitag*, Swed. *Fredag*), the sixth day of the week, takes its name from the goddess Frigga, the wife of Odin, to whom it was consecrated. The word is, however, often connected with Freyja, the goddess of love, to which notion the Latin name is due. As the day of the week on which the Crucifixion of our Lord took place, it has had a special sanctity among most Christian peoples, and Roman Catholics still hold it as a weekly fast. The Friday in Holy Week is the day on which the Passion is celebrated, and as such is the most solemn of the fasts and festivals of the Christian church. Almost everywhere within the range of Christendom, Friday is a day of proverbial ill-luck, on which it is not wise to put to sea, to marry, or commence any important undertaking. In some places other days are unlucky for particular enterprises, but Friday holds its character everywhere and for undertakings of all kinds. Among no class of men is this notion more persistent than among mariners, who, whether Spaniards, Italians, Bretons, Finns, or Englishmen, alike manifest the same disinclination to put to sea that day; and recount many a story of disaster that has followed some too greatly daring crew, the memory unconsciously retaining the few confirming cases, while the many exceptions are easily forgotten. A persistent but not localised tradition in both England and America tells of a ship, the keel of which was laid on Friday, that was launched on Friday, with the name of Friday, and sent to sea on Friday, under a Captain Friday, but which deservedly was never heard of again. Shipping statistics still show a smaller number of sailings upon that than upon any other day—it may be well for sailors to be reminded that Columbus both sailed and discovered land on Friday, and that the Pilgrim Fathers touched land on the same day.

Although the Russian name for Friday, *Pyatnitsa* (*pyat*, 'five'), has not a similar mythological significance with *Friday* or *Vendredi*, the day was consecrated by the ancient Slavonians to some goddess similar to Venus or Freyja. Afanasief explains the Carinthian name *Sibne dau* as indicating that it was once holy to Siva, the Lithuanian Seewa, the Slavonic deity corresponding to Ceres. In Christian time the deity presiding over Friday became merged in St Prascovia, and is now addressed under the compound name of 'Mother Pyatnitsa-Prascovia.' She wanders about the house on her holy day, and is displeased to see sewing, spinning, weaving, and the like going on, revenging herself by plagues of sore eyes, whitlows, and agnails. Especially must the house be clean of dust on the Thursday evening, so that she may not be offended on her visit the next day.

Frideswide, ST, the patroness of Oxford, was born there early in the 8th century, the daughter of Dida, an ealdorman. She preferred the religious life to marriage with Algar, a great Mercian noble, who, coming in search of her, was struck blind. She died on 14th November at Oxford (q.v.), and was formally canonised in 1481. Catherine, Peter Martyr's wife, was buried beside her pillaged shrine in 1552, exhumed by Cardinal Pole, but reinterred there in 1561, when the remains of the virgin saint and of the ex-nun were indissolubly mingled together. See F. Goldie, S.J., *The Story of St Frideswide* (1881).

Friedensville, a small post-village of Lehigh county, Pennsylvania, 6 miles SE. of Allentown, with a rich zinc mine and a famous pump, that raises nearly 30,000,000 gallons of water daily.

Friedland, a town of East Prussia, on the Alle, 26 miles SE. of Königsberg, with 3182 inhabitants. It is famous as the scene of Napoleon's victory, on 14th June 1807, over the Russian and Prussian forces under Bennigsen, which brought about the Treaty of Tilsit.—FRIEDLAND is also the name of a town in the north-east of Mecklenburg,

with 5502 inhabitants, and of a manufacturing town in the north of Bohemia, on the Wittig, 16 miles N. of Reichenberg by rail, with a pop. of 4817. The last gave name to the duchy from which Wallenstein (q.v.) took his title of Duke of Friedland.

Friedland, VALENTIN, a remarkable educationist, generally called *Trotzendorf*, from his birthplace, near Görlitz, in Prussian Silesia, was born 14th February 1490. At Leipzig he studied Latin under Peter Mosellanus and Greek under Richard Crocus, and he began his career as a teacher in the school at Görlitz. On the dawn of the Reformation he proceeded to Wittenberg, and studied under Luther and Melanchthon. Settling at Goldberg, in Silesia, as rector of the gymnasium there in 1531, Friedland introduced into his school a novel system of instruction and of discipline, which soon spread the fame of the institution through all the adjoining countries of Europe. The principal feature of the disciplinary system was that the preservation of order and decorum was left in the hands of the boys themselves. Instruction was imparted through the medium of academic discussions, coupled with frequent repetitions and examinations. Friedland died, 26th April 1556, at Liegnitz, whither he had removed his school two years before. See the biographies by Herrmann (1727), Frösch (1818), Pinzger (1825), Köhler (1848), and Löschke (1856).

Friedrich, JOHANN, a Catholic theologian, a leader with Döllinger in the Old Catholic movement. Born in Franconia in 1836, he became a professor of Theology at Munich in 1865; assisted at the Vatican Council in 1870; and subsequently, in life and labours, has been identified with the Old Catholics (q.v.).

Friedrichroda, a town of Thüringen in the charming Schilfwasser valley, 13 miles SW. of Gotha by rail, is a favourite summer-resort, receiving some 7000 visitors yearly. Here is the Duke of Gotha's beautiful country seat, Reinhardsbrunn, on the site of the old abbey of that name, destroyed in the Peasant War. Pop. (1895) 4248.

Friedrichsdorf, a town in the Prussian province of Hesse-Nassau, on the southern slope of the Taunus, 3 miles NE. of Homburg. It was founded in 1687 by thirty-two Huguenot families, and its 1200 inhabitants still speak French.

Friedrichsruh, the castle and estate of Prince Bismarck, in Lauenburg, 16 miles SE. of Hamburg.

Friendly Islands, or TONGA GROUP, lie 250 miles ESE. of Fiji (q.v.), number 32 inhabited and about 150 small islands, and consist of three sub-groups, with a collective area of only 385 sq. m. Tonga-tabu (130 sq. m.) is the largest; and next in importance are Eooa, Vavu, Namuka and Lefuka, Tofoa, Late, and Kao. The great majority are of coral formation; but some are volcanic; there are several active volcanoes, such as Tofoa (2781 feet) and Late (1787); and earthquakes are frequent. During a severe volcanic disturbance in October 1885 a small island 20 miles north-west of Honga Hapai was upheaved, and named Sandfly Island, after the government schooner which first visited it. A treaty was concluded with Germany in 1876, with Great Britain in 1879; the convention between Britain and Germany in 1886 provided for the neutrality of this archipelago, and in 1899 Germany renounced all her rights here in favour of Britain. The Friendly Islands were discovered by Tasman in 1643, but received their collective name from Cook, who visited them in 1777. Both these navigators found the soil closely and highly cultivated, and the people apparently unprovided with arms. The climate is salubrious, but humid; hurricanes are frequent. Among the products of the islands are tropical fruits, copra, coffee, sponges, cocoa-nuts, and arrowroot. The imports in 1894 amounted to £82,831, and the exports to £67,633. The flora resembles that of the Fiji group; but the native animals are very few. In the south part of Tonga-tabu there is an ancient monument of two

perpendicular rectangular blocks of stone about 40 feet high, with a slab across the top, and thereon a stone bowl. The stones must have been brought by sea.

The Friendly Islands were first visited by missionaries in 1797. In 1827 the work of evangelisation fell into the hands of the Wesleyan Methodists, and, after a lengthened and perilous struggle with the savage paganism of the inhabitants, it was crowned with success. Almost all the islanders (who, unlike the Fijians, belong to the fair Polynesian stock) are now Christians; many can speak English, and schools are numerous. In mental development, skill in house-building, &c., they are superior to other South Sea islanders. They are, however, decreasing in numbers; once estimated at 40,000 or 50,000, they had dwindled to 17,500 in 1893. The various islands used to be governed by independent chiefs, but in 1845 they were brought under the rule of King George (1818–93), who in 1862 gave the islands a 'constitution' and summoned a parliament. He was succeeded by his great-grandson, George II. See H. S. Cooper's *Coral Islands* (1880), and Basil Thompson's *Diversions of a Prime Minister* (1895).

Friendly Societies. The prototype of the modern friendly society has been found in the medieval trade or craft guilds; and there is some connection between the older specimens of the village benefit club and these guilds, which were the friendly societies of their day. During the nonage of Edward VI. the craft guilds were disestablished and disendowed (their revenues becoming the prey of greedy courtiers); but there are traces in some rural districts of England that the convivial, if not the beneficial, aspect of the old guilds survives in the annual feast of the village club. The germ, however, of the present system of mutual provident associations under the friendly society form is contained in Defoe's *Essays on Several Projects* (1696), in which the author of *Robinson Crusoe* advocated the promotion of 'societies formed by mutual assurance for the relief of the members in seasons of distress . . . by which not a creature so miserable or so poor but should claim subsistence as their due, not ask it of charity.' Indeed, it would seem as though Defoe was only seeking to extend the operations of

a species of thrift institution already in existence, since we find a London society founded in 1687 among the dozen known survivors of benefit clubs established during the last quarter of the 17th and the first half of the 18th century. The Ancient Order of Free Gardeners is of considerable antiquity in Scotland, the oldest known lodge being that of Dunfermline, the charter of which dates from 1715.

This form of provident insurance is peculiar to the English-speaking race, and is the invention of the industrial classes of Great Britain, as the means whereby they have supplied their economic needs for themselves by themselves, 'no man showing them the way, not by prescription of law, not by influence of superiors.' In 1793 the legislation first recognised the expediency of protecting and encouraging friendly societies, and enacted 'that it should be lawful for any number of persons in Great Britain to form themselves into and to establish one or more society or societies of good fellowship, for the purpose of raising from time to time, by subscriptions of the several members, a stock or fund for the mutual relief and maintenance of all and every the members thereof, in old age, sickness, and infirmity, or for the relief of the widows and children of deceased members' (Rose Act). And a parliamentary committee of 1825 excellently gives the *raison d'être* of the mutual friendly society as compared with the individualistic savings-bank: 'Whenever there is a contingency, the cheapest way of providing against it is by uniting with others, so that each man may subject himself to a small deprivation, in order that no man may be subjected to a great loss. He upon whom the contingency does not fall does not get his money back again, nor does he get for it any visible or tangible benefit; but he obtains security against ruin, and consequent peace of mind. He upon whom the contingency does fall gets all that those whom fortune has exempted from it have lost in hard money, and is thus enabled to sustain an event which would otherwise overwhelm him. The individual depositor, not the contributor to a common fund, is really the speculator. If no sickness attacks him during his years of strength and activity, and he *dies* before he is past labour, he has been successful in his speculation; but if he fall sick at an early period, or if he live to old age, he is a great loser, for his savings, with their accumulations, will support him but a short time in sickness.' What the Rose Act of 1793 was to societies that existed in the last decade of the 18th century the enabling enactment of 1829 (10 Geo. IV. chap. 56) was to societies which belonged to a more developed period of history. Much of the efficiency and good working of this act was due to the new departure taken by its sponsor, Lord Portman, then M.P. for Dorsetshire, in putting himself into communication with representatives of those bodies for which he purposed to legislate. The Act of 1829 'forms the transition from the system of local to that of central registration,' and the supplementary Act of 1834 carried centralisation a step further. Prior to the date of the former act a provincial system of registration and returns prevailed, each clerk of the peace holding the office of registrar for his several county, the rules being certified and the scales of contributions passed by the county magistrates. But henceforth three registrars of co-ordinate authority for England, Scotland, and Ireland were appointed. The provision requiring justices to be satisfied that the tables of contributions and benefits might be 'adopted with safety to all parties concerned' was repealed; but, in view of existing imperfect and inefficient data in the matter of vital statistics, societies were under the obligation of making quinquennial returns of their sickness and mortality experience. The following privileges of the Act of 1793 were confirmed: power to recover funds from defaulting officers by summary proceedings; priority of claims for moneys on the assets of any deceased or bankrupt officer or trustee; power to determine disputes by arbitration, and of justices to enforce compliance with the ruling of the arbitrators; exemption of stamp duty on bonds.

The Victorian era was contemporaneous with the financial period in the history of the friendly society system. Hitherto societies had been rather benevolent than benefit, more convivial than financial, in their status. But with Mr Charles Ansell came the dawn of actuarial light on the friendly society world. The purely scientific principles laid down by Mr Ansell were rectified and extended by Mr Neison the elder, in his *magnum opus*, *Contributions to Vital Statistics* (1845). Five years later appeared *Observations on the Rate of Mortality and Sickness amongst Friendly Societies*, &c., with a series of tables showing the value of annuities, sick gifts, assurance for death, and contributions to be paid equivalent thereto, calculated from the experience of the Manchester Unity of Oddfellows, by Henry Ratcliffe, corresponding secretary. The outcome was the famous 'Ratcliffe Tables,' subsequently corrected by the compiler, and endorsed by the Royal Commission of 1871–74 as the soundest and most reliable tables extant. Thus twenty-five years prior to the Friendly Societies Act of 1875 (which embodied the recommendations of the commissioners), making a valuation of assets and liabilities compulsory, the late secretary and actuary of the Manchester Unity laid down the true principles of financial security, and prepared the way for a process of self-reform in the society which it would be difficult to match in the history of any other public and corporate body. The classification of the various trades of members occupied Mr Ratcliffe from 15 to 17 hours per day, and 1,321,048 years of life were brought under observation. It was not until 1850 that the affiliated class of friendly society received legal recognition under a temporary act, which became, five years later, a permanent measure (18 and 19 Vict. chap. 63). Prior to this date they had been illegal combinations, coming under the clauses of the Corresponding Societies Act (39 Geo. III. chap. 79) and of the Seditious Meetings Act (57 Geo. III. chap. 19). The legal recognition was, however, of little use to the affiliated societies, since the then newly-appointed registrar, Mr J. Tidd Pratt, in opposition to the spirit as well as the wording of the act, refused to allow the registration of branches of the orders, except as separate and isolated societies —a misruling which was not corrected, so far as branches registered under this act and not registered under the Act of 1875 were concerned, till 1886 (Supreme Court of Appeal: Scholfield and others *v.* Vause and others). The only other alterations of importance were the requirement of an actuarial certificate in the case of societies granting an annuity or superannuation benefit, and the abolition of all fees for registry. The Act of 1855 failing to bring about the beneficial results hoped for by its promoters, in 1871 a Royal Commission of Inquiry was appointed, with Sir Stafford Northcote (the late Lord Iddesleigh) for chairman and J. M. Ludlow, Esq., secretary. The labours of the Commissioners extended over a period of four years, and the recommendations of their final report (1874) were embodied in the act now in force (38 and 39 Vict. chap. 60), which, owing to the above-mentioned ruling of Mr J. Tidd Pratt, had to be supplemented by a short Amendment Act (1876), under which societies with branches (i.e. affiliated orders) could be registered as such. The following are among the principal alterations effected by the Acts of

1875–76: one chief registrar and three assistants, instead of three separate registrars for England, Scotland, and Ireland with co-ordinate authority; special clause (30) dealing with collecting societies; deposit of rules by unregistered societies no longer allowed; annual audits required; valuation of assets and liabilities required every five years; public auditors and valuers to be appointed by the treasury, but their employment not compulsory; the number of members who can apply to the registrar for an award of dissolution reduced; further powers given to the registrar on this point. Alterations in friendly society law subsequent to 1876 have been unimportant, and generally introduced 'to declare the true meaning' of some clause in the Act of 1875. Note, however, should be made of 50 and 51 Vict. chap. 56, which empowers juvenile societies and branches to retain membership till the age of twenty-one years, the former limit being sixteen years. Societies and branches consisting wholly of members between three and twenty-one years of age may be registered, provided (1) they are in connection with some adult society registered under the act, or a branch of any such society, or (2) in connection with some institution or school.

Owing to technical legal difficulties, the registry office is unable to supply accurate information as to the present numerical and financial strength of the friendly society position; but the writer, from returns specially made to him, is in a position to give the following estimate (which will be found approximately correct) of the principal types of society, registered and unregistered:

	No. of Members	Funds
(1) Affiliated Societies	2,024,000	£13,103,000
(2) General with County Societies	300,000	1,500,000
(3) Peculiar Trade Societies		
(*a*) Railway Group	57,000	144,000
(*b*) Miners' Permanent Relief Funds	230,000	253,000
(4) Local Societies, inclusive of Dividing Clubs	1,000,000	2,000,000
(5) Collecting Societies	3,590,000	2,286,000
(6) Societies of Women	10,000	
(7) Juvenile Societies	200,000	190,000
Total	7,411,000	£19,476,000

(1) The affiliated societies are broadly distinguished from their competitors for public favour by being before all things 'friendly' fraternities, in which the social element is the motor of action sick and burial clubs, and something more. Long ago this type of society crossed the seas and accompanied the emigrant to his new home in 'Greater Britain.' In constitution and government the orders, as they are termed, are pure democracies. First comes the individual branch—lodge, court, tent, or senate—possessing an independence of management (subject only to general law), and retaining its own sick fund. Then succeeds the district (the limbs, as it were, of the body), a local gathering of branches within a certain given area, in which the funeral allowance is reinsured; and, lastly, the central body itself, called by some distinctive name (as Annual Movable Committee, High Court Meeting), an annually or biennially elected parliament of delegates, carrying out its rules and regulations through a working executive. The far and away largest bodies are the Oddfellows (Manchester Unity) and the Ancient Order of Foresters, appropriating between them 1,313,721 members out of the grand total for the class and £10,495,000 of the funds. Other important orders are United Order of Oddfellows (150,806), Temperance Order of Rechabites (75,000), Ashton Unity of Shepherds—the strongest order in Scotland—(71,000), and Order of Druids (58,216). The average cost of management is 7 per cent. of the annual contributions. (2) Is a development of the purely local class to meet the altered needs of the day. The class consists of societies of divers degrees of merit, but all possessing a common central fund. The giant among them is the Hearts of Oak (London), with its 115,284 members and capital of close on one million sterling. The county societies are the 'old established houses' belonging to the 'patronised' group, and are being deserted for the better known of the orders. (3) This class is specially devoted to insurance against the fatal and non-fatal accidents of hazardous occupations, and was used by workmen contracting themselves out of the Employers' Liability Act (1880; superseded by the Workmen's Compensation Acts, 1897 1900; see LIABILITY OF EMPLOYERS). Certain of the professions have established benefit institutions—e.g. Medical Sickness and Annuity, and Clergy Friendly Societies, the former possessing a membership of over 1000 and funds to the value of nearly £25,000. (4) Local societies are fast disappearing before the onward march of a better class of mutual provident association. But the low type of friendly society which periodically divides its funds, and is always beginning afresh to run in the thrift race, is sadly too prevalent; the increasing liability to sickness with advancing years is altogether ignored; a blind eye is turned on the future. (5) Societies which gather in their weekly or fortnightly pence by means of collectors calling from door to door. The bulk of membership is composed of the most necessitous poor, and probably two-thirds are women or children. No benefit beyond an insurance at death is given. The actual number of societies forming the class is a small one compared with the total number; for England only 47 out of about 24,000 different bodies registered as societies or branches; in Scotland 5 out of 900; in Ireland none out of some 400. The largest societies are the Royal Liver (1,211,259) and the Liverpool Victoria Legal (1,003,787). The expenses of management, with commissions, range from 20 to 52 per cent. of the annual premiums. The numerical increase of the class is only surpassed by that of the Industrial Assurance Companies. (6) Societies of women are but poorly represented in the voluntary thrift army, and the few that exist were mostly established in an unfinancial age. An order which aims to be national in its area of membership was, however, established in 1885 by a clergyman of the Church of England (Rev. J. Frome Wilkinson), which has already opened branches in several counties (one in Scotland), and should meet the ever-increasing economic needs of women. The society is registered as the United Sisters' Friendly Society (Suffolk Unity). (7) Juvenile societies are the thrift 'nurseries' of the adult societies, and are mostly confined to the affiliated class, the largest number of branches being in connection with the Foresters, Manchester Unity, and Rechabites. There is a steady increase in the popularity of juvenile friendly society membership.

Tests of Financial Security and Good Management.—Registration, 'not because registry of itself can make any society safe, but because its position must be always unsafe without registry.' Rates of contribution for benefits, both sick and funeral, on a graduated or sliding scale, according to age on entry, which rates themselves shall be held by actuarial authority sufficient to carry benefits contracted for. Record of yearly sickness and mortality experience kept, so that the valuer may be in possession of sufficient data by which to estimate the society's or branches' liabilities. Yearly audit and five-yearly financial overhaul or efficient valuation of assets and liabilities. Effect given, without undue delay, to remedial measures recommended by valuer, should liabilities exceed assets. The several insurance funds kept separate, and

expenses of management provided for. Sick benefits insured till sixty-five, at which age a pension or deferred annuity shall commence, and continue for remainder of life. Reserve funds to realise a clear percentage of interest, equal to that on which tables or scales of contributions have been calculated, generally 3 per cent. Candidates refused who cannot 'pass' the doctor, or who have exceeded in years the maximum limit of forty-five, forty being preferred. Efficient supervision of sick payments to guard against 'malingering' or fictitious claims. Society not to be of local isolated type, dependent solely on its own resources, but associated with other branches of one and the same organisation, or of the centralised type. Means to be taken, in seasons of distress or loss of work, whereby membership may be retained. Provision, if desired, for juveniles, widows, orphans, and decayed members.

The Friendly Societies Act, 1896, and the Collecting Societies and Industrial Assurance Companies Act, 1896, consolidate the law. The annual report of the Chief Registrar of Friendly Societies includes Friendly Societies proper with their branches, Benevolent Societies, Cattle Insurance Societies, Working Men's Clubs, Industrial and Provident (Co-operative) Societies, Trade Unions (q.v.), Building Societies (q.v.), Certified Loan Societies, Trustee Savings-banks (see SAVINGS-BANKS), Railway Savings-banks, and certain Scientific and Literary and other authorised societies. The following table gives particulars of Friendly Societies proper, from the report for 31st December 1899:

	No. of Returns.	No. of Members.	Amount of Funds.
Ordinary Friendly Societies. ...	7,161	2,725,533	£13,170,214
Branches of Registered Orders..	21,557	2,555,736	18,506,183
Collecting Friendly Societies....	39	5,555,827	4,832,573
Medical Societies.....	87	293,477	68,278
Benevolent Societies.....	76	21,583	291,383
Working Men's Clubs.....	572	161,231	171,409
Specially Authorised Societies..	435	107,811	871,180
Cattle Insurance societies.... .	58	3,612	6,482
	29,985	11,424,810	£37,917,702

For further information, the following authorities may be consulted: W. Tidd Pratt's *Law of Friendly Societies* (1881); Dr Baernreither's *English Associations of Working Men* (1889); the present writer's *Friendly Society Movement* (1886) and *Mutual Thrift* (1891); *Year Book of Friendly Societies Registry Office*; Annual Reports of Chief Registrar. Also Ratcliffe's *Experience of the Manchester Unity*; Mr Francis G. P. Neison's *Foresters' Experience*; and the same eminent actuary's *Observations on the Efficient Valuation of Friendly Societies.*

Friends, SOCIETY OF, the designation proper of a sect of Christians, better known as Quakers. Their founder in 1648–66 was George Fox (q.v.). In spite of severe and cruel persecutions, the Society of Friends succeeded in establishing themselves both in England and America. They have, indeed, never been numerically powerful (having at no time exceeded 200,000 members); but the purity of life which from the beginning has so honourably distinguished them as a class has unquestionably exercised a salutary influence on the public at large; while in respect of certain great questions affecting the interests of mankind, such as *war* and *slavery*, they have, beyond all doubt, originated opinions and tendencies which, whether sound or erroneous, are no longer confined to themselves, but have widely leavened the mind of Christendom. Eminent Friends have been George Fox, Robert Barclay, Thomas Ellwood, William Penn, Elizabeth Fry, Mrs Opie, J. J. Gurney, Bernard Barton, Dalton the physicist, John Bright, Birket Foster, &c.; 'unfriendly' Friends were Benjamin Robins, who revolutionised the art of Gunnery (q.v.), Tom Paine, and Sir Richard Church.

(1) *Doctrine.*—It is perhaps more in the spirit than in the letter of their faith that the Society of Friends differ from other orthodox Christians. They themselves assert their belief in the great fundamental facts of Christianity, and even in the substantial identity of most of the doctrinal opinions which they hold with those of other evangelical denominations. The Epistle addressed by George Fox and other Friends to the governor of Barbadoes in 1673 contains a confession of faith not differing materially from the so-called Apostles' Creed, except that it is more copiously worded and dwells with great diffuseness on the internal work of Christ. The Declaration of Christian Doctrine put forth on behalf of the Society in 1693 expresses a belief in what is usually termed the Trinity, in the atonement made by Christ for sin, in the resurrection from the dead, and in the doctrine of a final and eternal judgment; and the Declaratory Minute of the yearly meeting in 1829 asserts the inspiration and divine authority of the Old and New Testament, the depravity of human nature consequent on the fall of Adam, and other characteristic doctrines of Christian orthodoxy, adding: 'Our religious Society, from its earliest establishment to the present day, has received these most important doctrines of Holy Scripture in their plain and obvious acceptation.' It is nevertheless certain that uniformity of theological opinion cannot be claimed for the Friends, any more than for other bodies of Christians. As early as 1668 William Penn and George Whitehead held a public discussion with a clergyman of the English Church, named Vincent, in which they maintained that the doctrine of a tri-personal God, as held by that church, was not found in the Scriptures, though in what form they accepted the doctrine themselves does not appear; and some time later Penn published a work himself, entitled the *Sandy Foundation Shaken*, in which, among other things, he endeavoured to show that the doctrines of vicarious atonement and of imputed righteousness do not rest on any scriptural foundation. But in general the Society of Friends, in the expression of their belief, have avoided the technical phraseology of other Christian churches, restricting themselves with commendable modesty to the words of Scripture itself, as far as that is possible, and avoiding, in particular, the knotty points of Calvinistic divinity (see Barclay's *Catechism and Confession of Faith*, published in 1673, where the answers to the questions—to avoid theological dogmatism—are taken from the Bible itself). This habit of allowing to each individual the full freedom of the Scriptures has, of course, rendered it all the more difficult to ascertain to what extent individual minds, among the Society, may have differed in their mode of apprehending and dogmatically explaining the facts of Christianity. Their principal distinguishing doctrine is that of the 'Light of Christ in man,' on which many of their outward peculiarities, as a religious body, are grounded. The doctrine of the internal light is founded on the view of Christ given by St John, who, in the first chapter of his gospel, describes Christ—the Eternal Logos—as the 'life' and 'light of men,' 'the true light,' 'the light that lighteth every man that cometh into the world,' &c. Barclay taught that even the heathen were illumined by this light, though they might not know—as, indeed, those who lived before Christ *could* not know—the historical Jesus in whom Christians believe. In their case Christ was the light shining in darkness, though the darkness comprehended it not. The existence of 'natural virtue' (as orthodox theologians term it) among the heathen was denied by Barclay, who regarded all such virtue as Christian in its essence, and as proceeding from the light of Christ shining through

the darkness of pagan superstition. These opinions would seem to be somewhat freer than those expressed in the General Epistle of the Society published in 1836, wherein they refuse to acknowledge 'any principle of spiritual light, life, or holiness inherent by nature in the mind of man,' and again assert that they 'believe in no principle whatsoever of spiritual light, life, or holiness, except the influence of the Holy Spirit of God bestowed on mankind in various measures and degrees through Jesus Christ our Lord.' But, on the other hand, in a little treatise published by the Society in 1861 it is affirmed that 'the Holy Spirit has always been afforded in various measures to mankind;' while stress is also laid on the statement of St Paul, that 'the grace of God (understood by Friends to signify the 'operation of the Divine Spirit') that bringeth salvation *hath appeared to all men*.' And another exponent of their views, Mr T. Evans, of Philadelphia, states that 'God hath granted to all men, of whatsoever nation or country, a day or time of visitation, during which it is possible for them to partake of the benefits of Christ's death, and be saved. For this end he hath communicated to every man a measure of the light of his own Son, a measure of grace or the Holy Spirit, by which he invites, calls, exhorts, and strives with every man, in order to save him; which light or grace, as it is received, and not resisted, works the salvation of all, even of those who are ignorant of Adam's fall, and of the death and sufferings of Christ, both by bringing them to a sense of their own misery, and to be sharers in the sufferings of Christ inwardly, and by making them partakers of his resurrection, in becoming holy, pure, and righteous, and recovered out of their sins.' Hence it may be safely asserted that they hold a broader (or, as others would say, a more latitudinarian) view of the Spirit's working than any other Christian church or society. In America, about the year 1827, Elias Hicks, a Friend of very remarkable powers, created a schism in the Society, by the promulgation of opinions denying the miraculous conception, divinity, and atonement of Christ, and also the authenticity and divine authority of the Holy Scriptures. About one-half of the Society in America adopted the views of Hicks, and are known as Hicksite Friends; their opinions, of course, are repudiated by the rest of the Society, who may be described as Orthodox Friends. The Hicksite schism thoroughly alarmed the latter, both in England and America, and a movement was begun in favour of education, of a doctrinal belief more nearly allied to that of the so-called 'Evangelical' party, and of a relaxation in the formality and discipline of the Society. The leader of this movement was Joseph John Gurney, of Norwich. This new tendency, however, excited considerable opposition among some of the Friends in America; and the consequence was a division among the Orthodox Friends themselves, and the formation of a new sect, called 'Wilburites,' after the name of their founder, John Wilbur, who are noted for the strictness with which they maintain the traditions and peculiarities of the Society. Some slight indications of theological differences have manifested themselves in England also.

(2) *Practice.*—It is in the application of their leading doctrine of the 'internal light' that the peculiarities of the Friends are most apparent. Believing that it is the Holy Spirit, or the indwelling Christ, that alone maketh wise unto salvation, illumining the mind with true and spiritual knowledge of the deep things of God, they do not consider 'human learning' essential to a minister of the gospel, and look with distrust on the method adopted by other churches for obtaining such—viz. by formally training after a human fashion a body of youths chosen on no principle of inward fitness. They believe that the call to this work now, as of old, is 'not of men, neither by man, but by Jesus Christ and God the Father,' and that it is bestowed irrespectively of rank, talent, learning, or sex. Consequently, they have no theological halls, professors of divinity, or classes for 'students.' Further, as fitness for the ministry is held to be a free gift of God through the Holy Spirit, so, they argue, it ought to be freely bestowed, in support of which they adduce the precept of the Saviour—'Freely ye have received, freely give;' hence those who minister among them are not paid for their labour of love, but, on the other hand, whenever such are engaged from home in the work of the gospel, they are, in the spirit of Christian love, freely entertained, and have all their wants supplied: in short, the Friends maintain the absolutely voluntary character of religious obligations, and that Christians should do all for love, and nothing for money. It also follows from their view of a call to the work of the ministry that women may exhort as well as men, for the 'spirit of Christ' may move them as powerfully as the other sex. The prophecy of Joel as applied by Peter is cited as authority for the preaching of women: 'On my servants and on my handmaidens I will pour out in those days of my Spirit, and they shall prophesy.' They also adduce the New Testament examples of Tryphæna, Tryphosa, the beloved Persis, and other women who appear to have laboured in the gospel. Their mode of conducting public worship likewise illustrates the entireness of their dependence on the 'internal light.' In other religious bodies the minister has a set *form* of worship, through which he must go, whether he feels devoutly disposed or not. This seems objectionable to the Friends, who meet and remain in silence until they believe themselves moved to speak by the Holy Ghost. Their prayers and praises are, for the most part, silent and inward. They prefer to make melody in their hearts unto God, considering such to be more spiritual than the outward service of the voice.

The doctrine of the 'internal light' has also led the Friends to reject the ordinances of Baptism and the Lord's Supper as these are observed by other Christians. They believe the Christian baptism to be a spiritual one, and not, like the Jewish and heathen baptisms, one with water; in support of which they quote, among other passages, the words of John the Baptist himself: 'I baptise you with water, but there cometh one after me who shall baptise you with the Holy Ghost and with fire.' Similarly do they regard the rite of the Eucharist. It is, say they, inward and spiritual, and consists not in any symbolic breaking of bread and drinking of wine, but in that daily communion with Christ through the Holy Spirit, and through the obedience of faith, by which the believer is nourished and strengthened. They believe that the last words of the dying Redeemer on the cross, 'It is finished,' announced the entire abolition of symbolic rites, that, under the new spiritual dispensation then introduced, the necessity for such, as a means of arriving at truth, ceased, and that their place has been abundantly supplied by the Comforter, the Holy Ghost, whose office it now is to lead and guide men into all truth. The true Christian supper, according to them, is set forth in revelation—'Behold I stand at the door and knock: if any man hear my voice and open the door, I will come in unto him, and will sup with him and he with me.' For the same reason—viz. that the teaching of the Spirit is inward and spiritual—the Friends ignore the religious observance of days and times, with the exception of the Sabbath.

The taking or administering of oaths is regarded by Friends as inconsistent with the command of

Christ, 'swear not at all,' and with the exhortation of the apostle James—'Above all things, my brethren, swear not, neither by heaven, neither by the earth, neither by any other oath: but let your yea be yea, and your nay, nay; lest ye fall into condemnation' (see AFFIRMATION). They also refused to pay tithes for the maintenance of what they hold to be a hireling ministry, believing that Christ put an end to the priesthood and ceremonial usages instituted under the Mosaic dispensation, and that he substituted none in their place. In consequence, all consistent Friends were regularly mulcted of plate, furniture, or other goods, to the value of the amount due. The conversion of tithe into *rent-charge* (see TITHES), however, has, in the opinion of many Friends, largely removed objections to the payment to this ecclesiastical demand. In regard to the civil magistracy, while they respect and honour it, as ordained of God, they are careful to warn the members of their Society against thoughtlessly incurring its responsibilities, involving as it does the administration of oaths, the issuing of orders and warrants in reference to ecclesiastical demands, the calling out of an armed force in cases of civil commotion, and other duties inconsistent with the peaceful principles of the Society. The Friends have likewise consistently protested against war in all its forms; and the Society has repeatedly advised its members against aiding and assisting in the conveyance of soldiers, their baggage, arms, ammunition, or military stores. They regard the profession of arms and fighting, not only as diametrically opposed to the general spirit of Christ, whose advent was sung by angels in these words: 'Glory to God in the highest, and on earth peace, good-will toward men;' but as positively forbidden by such precepts as—'Love your enemies, bless them that curse you, do good to them that hate you, and pray for them which despitefully use you and persecute you;' also, 'Resist not evil; but whosoever shall smite thee on thy right cheek, turn to him the other also;' and, while they acknowledge that temporary calamities may result from adopting this principle of non-resistance, they have so strong a faith in its being essentially the dictate of divine love to the Christian heart that they believe God, by his wise and omnipotent providence, could and will yet make it 'mighty to the pulling down of the strongholds of iniquity.' The world, they believe, will by-and-by confess that the peace-makers are most truly the children of God. The efforts of the Society for the emancipation of the slaves are a part of modern British history. They may most certainly lay claim to having cultivated the moral sense of their fellow-countrymen in regard to this important question. As early as 1727 they commenced to 'censure' the traffic in slaves, as a practice 'neither commendable nor allowed,' and gradually warmed in their opposition, until the whole nation felt the glow, and entered with enthusiasm on the work of abolition. In respect to what may be called minor points, the Friends are also very scrupulous; they object to 'balls, gaming-places, horse-races, and playhouses, those nurseries of debauchery and wickedness, the burden and grief of the sober part of other societies as well as of our own.' The Printed Epistle of the yearly meeting of 1854 contains a warning against indulging in music, especially what goes by the name of 'sacred music,' and denounces musical exhibitions, such as oratorios, as essentially a 'profanation'—the tendency of these things being, it is alleged, 'to withdraw the soul from that quiet, humble, and retired frame in which prayer and praise may be truly offered with the spirit and with the understanding also.' They object, besides, to 'the hurtful tendency of reading plays, romances, novels, and other pernicious books;' and the yearly meeting of 1764 'recommends to every member of our Society to discourage and suppress the same.' A similar recommendation was issued by the Society in 1851 for the benefit of 'younger Friends' in particular, who would appear to have been tasting the forbidden fruit. The Printed Epistle of the yearly meeting of 1724 likewise 'advises against imitating the vain custom of wearing or giving mourning, and all extravagant expenses about the interment of the dead,' and this advice has been repeatedly renewed. A multitude of other minute peculiarities, which it would be tedious to note in detail, distinguish the Friends from their fellow-Christians, but one or two of these may here be referred to. The Friends have from their rise, by example and precept, urged upon their members 'plainness of speech, behaviour, and apparel,' and hence, in the matters of dress and address, have arisen certain outward peculiarities by which a 'Friend' could always be distinguished. In speech they invariably make use of 'thee' and 'thou' in addressing a single person, without respect to rank, station, or authority, and in support of this they plead correct grammar and the example of Scripture.

They also felt called to cease from denoting the several months of the year and days of the week by the names usually made use of in designating them. Instead of January, February, &c., or Monday, Tuesday, &c., they adopted 'First Month,' 'Second Month,' 'First Day,' 'Second Day,' &c. For their practice in this respect they asserted that the names of the days and months used by others were given to them in honour of 'heathen deities,' and this they resolutely refused to countenance. Though there is not now the same uniformity of practice throughout the body in some of the minor peculiarities, they are to a considerable extent retained and adhered to.

(3) *Discipline.*—By the term discipline the Friends understand 'all those arrangements and regulations which are instituted for the civil and religious benefit of a Christian church.' The necessity for such discipline soon began to make itself felt, and the result was the institution of certain meetings or assemblies. These are four in number: the first, the *Preparative* meetings; second, the *Monthly* meetings; third, the *Quarterly* meetings; and, fourth, the *Yearly* meetings. The first are usually composed of the members in any given place, in which there are generally two or more Friends of each sex, whose duty is to act as overseers of the meeting, taking cognisance of births, marriages, burials, removals, &c., the conduct of members, &c., and reporting thereon to the monthly meetings, to whom the executive department of the discipline is chiefly confided. The monthly meetings decide in cases of violation of discipline, and have the power of cutting off or disowning all who by their improper conduct, false doctrines, or other gross errors, bring reproach on the Society, although the accused have the right of appeal to the quarterly meetings, and from these again to the yearly, whose decisions are final. The monthly meetings are also empowered to approve and acknowledge ministers, as well as to appoint 'serious, discreet, and judicious Friends, who are not ministers, tenderly to encourage and help young ministers, and advise others, as they, in the wisdom of God, see occasion.' They also execute a variety of other important duties. The quarterly meetings are composed of several monthly meetings, and exercise a sort of general supervision over the latter, from whom they receive reports, and to whom they give such advice and decisions as they think right. The yearly meeting consists of select or representative members of the quarterly meetings. Its function is to consider generally the entire condition of the Society in all its aspects. It receives in writing

answers to questions it has previously addressed to the subordinate meetings, deliberates upon them, and legislates accordingly. To it exclusively the legislative power belongs. Though thus constituted somewhat according to Presbyterian order, yet any member of the Society may attend and take part in the proceedings.

Women have also a special sphere of discipline allotted to them: they inspect and relieve the wants of the poor of their own sex, take cognisance of proposals for marriage, deal with female delinquents privately, and under certain restrictions may even do so officially, though in the 'testimony of disownment' they have always the assistance of members of the other sex.

The Society of Friends, in the multitude of its regulations, has not forgotten the poor; charity in its narrower, as well as in its broader sense, has always been a beautiful feature of its members. The care of the poor was one of the earliest evidences which Christianity afforded to the Gentiles of the superiority and divine character of its principles; and it is honourable to the society that a similar provision for those united to them in religious fellowship appears to have been one of the earliest occasions of their meetings for discipline. Nevertheless, in accordance with their ruling principle, that all Christian duty should be left for its fulfilment to the spontaneity of Christian love, and not performed under compulsion of any kind, 'the provision for the poor is purely voluntary;' yet their liberality is proverbial throughout Britain and America. Their number amounted in 1896 to 107,908, of whom three-fourths belonged to the United States.

See Fox's *Journal*; Sewel's *History of the Quakers* (1722); Besse's *Sufferings of the Quakers* (1752); Gurney's *Observations on the Peculiarities of the Society of Friends* (1824); Neale's *History of the Puritans*; Rowntree's *Quakerism Past and Present* (1859); Joseph Smith's *Descriptive Catalogue of Books by Friends* (2 vols. 1867); *Book of Christian Discipline of the Society of Friends* (1883); F. Storrs Turner, *The Quakers: a Study* (1890); Miss C. E. Stephen, *Quaker Strongholds* (1890).

Friends of the People, an association formed in 1792 in London to obtain parliamentary reform by constitutional means. Among its members were Lords Lauderdale, Kinnaird, John Russell, and Edward Fitzgerald, and such commoners as Grey, Mackintosh, Malcolm Laing, Dudley North, Erskine, Samuel Rogers, and Sheridan.

Fries, Elias, a Swedish botanist, was born, 15th August 1794, in the district of Femsjö in Småland, and studied at Lund, where he early taught botany. In 1834 he was called to the chair of Practical Economics at Upsala, with which in 1851 that of Botany was conjoined. Fries introduced into Sweden the morphological theory in his *Systema Orbis Vegetabilis* (1825). His *Systema Mycologicum* (3 vols. 1820–32) was long the standard work on the classification of fungi, of which he gave a relatively complete catalogue in *Summa Vegetabilium Scandinaviæ* (2 vols. Stockholm, 1846–49). He wrote a series of useful books on the Hymenomycetæ, on lichens, and on the flora of Scandinavia, more particularly of Sweden. Among his monographs the *Symbola ad Historiam Horaciorum* (Upsala, 1848) deserves especial mention. In 1851 Fries was appointed director of the botanical museum and garden at Upsala, and in 1853 rector of the university. He resigned in 1857, and died there, 8th February 1878.

Fries, Jakob Friedrich, the founder of a philosophic school in Germany, was born at Barby, in Prussian Saxony, 23d August 1773, studied at Leipzig and Jena, and in 1805 was called to Heidelberg as professor of Philosophy and Mathematics. In 1816 he accepted a call to the chair of Speculative Philosophy at Jena, but was deprived of his professorship on account of his participation in the democratic disturbances of 1819. In 1824, however, he was appointed to the chair of Physics and Mathematics, which he occupied till his death, 10th August 1843. Amongst his more important books are *System der Philosophie* (1804); *Neue Kritik der Vernunft* (3 vols. 1807); *System der Logik* (1811); *Handbuch der psychischen Anthropologie* (1820–21); *Die Lehren der Liebe, des Glaubens, und der Hoffnung* (1823); and *Geschichte der Philosophie* (1837–40). Taking the Kantian philosophy for his starting-point, Fries demonstrated that intuitive psychology must be the basis of all philosophising. Thus, through inner experience *a posteriori* we learn to know the subjective *a priori* conditions of knowledge; and through intuitive presentiment or faith we derive our certainty of the reality of things themselves. From inner assurance of the essential worth and personal dignity of men flow the definitions and sanctions of ethics, and from the same source originate our æsthetic and religious feelings. See Henke, *J. F. Fries* (1867).

Friesland, or Vriesland (ancient *Frisia*), in its widest sense, as the country of the Frisian race, included the modern provinces of Zealand, North and South Holland, part of Utrecht, Friesland proper, and Groningen in Holland, together with Prussian East Friesland and a part of Oldenburg, the western coast of Sleswick between the Eider and the Tondern, and the islands of Sylt, Föhr, Nordstrand, and others. The province of Friesland proper in the Netherlands is bounded N. by the German Ocean and W. and SW. by the Zuider Zee. It is sometimes called West Friesland to distinguish it from East Friesland. Area, 1282 sq. m.; pop. (1875) 311,246; (1894) 337,765. The land is flat, in some parts below the level of the sea, and is cut up by canals and streams. The lowlands are protected by artificial banks or dykes. Lakes and marshes are numerous. The dykes, sluices, and canals are under the care of a special board, and are kept up at the local expense. The inland and sea waters abound with fish. Rich pastures cover a third part of the surface. The horses, cattle, and sheep are all of excellent breeds. Large quantities of peat are dug. The capital is Leeuwarden, and the chief port Harlingen, whence are shipped cheese and butter (mostly to London), horses, cattle, leather, and wool. The climate is moist and misty, but not raw. The inhabitants, who are descended from the ancient Frisians, speak a peculiar dialect. The industries are unimportant. —East Friesland, with an area of 1200 sq. m., and a pop. amounting (1885) to 211,825, formerly a principality of Westphalia, now forms the Hanoverian district of Aurich; chief towns, Emden and Aurich. It is bounded N. by the German Ocean and W. by the Netherlands. Like West Friesland it is low and flat. With the help of the Prussian government the moors are being reclaimed and cultivated. Fishing and agriculture constitute the chief employment of the inhabitants, who are Frisians. This province has frequently changed owners since 1744, when the family of Cirksena, in whose possession it had been for 300 years, became extinct. It was first ceded to Prussia, next incorporated by Napoleon with Holland and France; in 1813 it was restored to Prussia; in 1815 it was ceded to Hanover, along with which it again forms part of Prussia. See Frisians, and H. M. Doughty's *Friesland Meres* (1889).

Frieze, in classical architecture, the central portion of the Entablature (q.v.). Vitruvius also

calls it the Zophorus ('life-bearing') from its being frequently ornamented with sculpture. Similarly, the term frieze is sometimes applied to any enriched horizontal band.

Frigate (Fr. *frégate*, Ital. *fregata*), formerly a long, narrow vessel propelled by oars and sails, used in the Mediterranean on occasions when speed was requisite. The name then came to be applied to men-of-war, of a class smaller than line-of-battle ships, and carrying from twenty to fifty guns, which were distributed on the main and upper decks. They were employed in the great wars of the 18th and early part of the 19th centuries, as scouts and cruisers. The frigate was usually swift, easily managed, and capable of beating well to windward. She became, therefore, the favourite ship in war-time, and bore off a large proportion of the prize-money. Frigates also served to obtain information as to the movements of hostile fleets, and to guide the sailing of their own; but it was unusual for them to join in the line of battle, their exploits ordinarily occurring in engagements with single ships of their own class. With steam and the growth of the royal navy in later times frigates were developed more than any other men-of-war, and many of the largest ships in the navy belonged to this class, such as the iron-plated *Warrior*, of 6000 tons, three times the burden of any ship of the line in Nelson's fleets. Now, however, these are all ships of the past, incapable of contending with the turreted monsters which carry modern artillery, and the name frigate itself has disappeared from the *Navy List*, the term 'cruiser'—armoured or unarmoured—having taken its place. This is true also of the United States navy.

Frigate Bird, or MAN-OF-WAR BIRD (*Tachypetes aquila*), a tropical marine bird, placed near pelicans and cormorants in the order Steganopodes. In flight it is extremely powerful, and makes use of its swiftness and strength to force other birds to surrender their prey. The food consists of fish, which, if not stolen, are caught at the surface. Flying-fish are said to form an important constituent of its diet. It may be seen out at sea 100 miles from land, but nests and breeds on the coasts of the tropical Atlantic and Pacific—e.g. off Honduras, where vast 'rookeries' have been described. The bird is large, measuring about 4 feet in length, with very long wings and tail.

Frigate Bird (*Tachypetes aquila*).

The beak is hooked, and almost twice as long as the head. The prevalent colour is brownish-black; the female has a white breast, and, like the young birds, differs in minor points from the adult male. In some parts it is said to become half-tame, and even to be available for letter-carrying.

Frigga, in northern mythology, the wife of Odin, who seems to have occupied an analogous position to that of Venus in Roman mythology. She was also the goddess of the earth and of marriage, and was frequently confounded, and latterly quite identified, with Freyja (q.v.). She was the only Scandinavian deity placed amongst the stars; Orion's belt is called in Swedish Frigga's distaff. From her Friday takes its name.

Frilled Lizard. See CHLAMYDOSAURUS.

Fringe Tree (*Chionanthus*), a genus of Oleaceæ, of which the common species or Fringe Tree or Snowflower (*C. virginica*), found in the United States from 39° lat. to the Gulf of Mexico, is a large shrub with very numerous snow-white flowers in panicled racemes. The limb of the corolla is divided into four long linear segments, whence the name fringe tree. The fruit is an oval drupe. The tree is frequently cultivated as an ornamental plant. The root bark is narcotic.

Fringillidæ. See FINCH.

Frisches Haff ('Fresh-water Bay'), a lagoon on the coast of Prussia, south-east of the Gulf of Danzig, about 50 miles in length, 4 to 11 miles broad, and 332 sq. m. in area. It was once entirely walled off from the Baltic by a narrow spit of land, through which a passage, 1247 feet wide and 14½ feet deep, was cut in 1510 during a violent storm. The Haff is 10 to 16 feet deep.

Frisians, a people of Teutonic stock, who, Tacitus says, when the Romans first came into contact with them, occupied the maritime region extending from the Scheldt to the Ems and Weser. They submitted to the Roman power in the reign of Drusus, and were loyal and helpful tributaries until stung into revolt in 28 A.D. by the extortions of a Roman provincial officer. From that time onwards they rendered only sullen submission to the empire, and more than once revolted and maintained their independence for some years. They were sea-rovers, as well as herdsmen and husbandmen, and took part along with the Angles and Saxons in the conquest of Britain. We next read of them as offering a stubborn resistance not only to the introduction of Christianity, but also to the encroachments of the Frankish power from the south; in fact, in spite of the efforts of Wilfrid of York, the first missionary among the Frisians, and his successors Willibrord and Boniface, the Christian religion does not seem to have obtained footing in Frisia beyond the actual limits of Frankish dominion until the complete absorption of the Frisians' land in the empire of Charlemagne. In the meantime they had waged an almost continuous war against the Franks. Their king Radbod, although driven out of western Frisia (from the Scheldt to the Zuider Zee) in 689 by Pepin, so far turned the tables after the death of this king that he sailed up the Rhine to Cologne, and defeated Charles Martel, in 716. Their last independent prince, Poppo, was defeated and slain by Charles Martel in 734, and the conquest of the Frisians was completed by Charlemagne. At the partition of the Frankish empire made at Verdun in 843 Frisia became part of Lotharingia or Lorraine. In 911, however, when Lotharingia seceded from the eastern to join the western Frankish empire, the districts of eastern Frisia (from the Zuider Zee to the Weser) asserted their independence, and formed themselves into a sort of democratic confederated republic, until in the first half of the 15th century they became virtually a countship, being ruled by the dynasty of the Cirksena down to the extinction of the family in 1744, when Prussia took possession of it. Meanwhile the western half of Frisia had for the most part been absorbed in the bishopric of Utrecht and the

countship of Holland, though not without a most stubborn resistance on the part of the Frisians, a resistance which had not wholly died out by the end of the 15th century. In fact in 1457 the Emperor Frederick III. recognised their immediate dependence upon the empire. And it was only in 1498 that their staunch love of liberty was finally crushed by Albert of Saxony, whom Maximilian had appointed hereditary imperial governor of Frisia. From 1523, when the governorship fell to Charles V., Frisia became virtually a part of the Netherlands, and from that time onwards shared their destiny.

The Frisian language is a member of the Low German family, coming intermediate between Old Saxon and Anglo-Saxon. Its most striking peculiarity is the modification of *k* and *g* into *ts* before the letters *e* and *i*. The oldest existing specimens of the language do not go back beyond the 14th and 15th centuries, and consist principally of the old law codes and similar official documents (collected in Richthofen, *Friesische Rechtsquellen*, 1840). The celebrated *Lex Frisionum*, although it belongs probably to the period of Charlemagne, is composed in Latin, and contains a very meagre sprinkling of Frisian terms. At the present day pure Frisian is spoken only by the peasantry in the west of Dutch Friesland and in one or two isolated districts of Prussian East Friesland, and is cultivated by a small coterie of men of literary taste in Holland. Corrupt forms are spoken in Heligoland and in parts of Jutland and Sleswick. Gysbert Japicx occupies the first place amongst Frisian writers, having published in 1668 a volume of poems entitled *Friesche Rijmkerye*. Other books held in great esteem by the Frisians are a comedy, *Waatze Gribberts Brilloft*, dating from the beginning of the 18th century, and the popular work, *It Libben fen Aagtje Dykstra's* (1827). *Het Oera Linda Bok*, of which an English edition appeared in 1877, though purporting to be of vast antiquity, was really written by a ship-carpenter, Over de Linden (1811–73). Besides these, quite modern works have been written by E. and J. H. Halbertsma, Salverda, Posthumus, Windsma, Dykstra, Deketh, Van der Veen, Van Assen, and others. The most important production in northern Frisian, the corrupt dialect of Jutland and Sleswick, is Hansen's comedy *De Gidtshals*. A society was founded at Franeker in 1829 for the study of the Frisian language and history.

The most complete accounts of Frisian literature are perhaps to be found in Mone, *Uebersicht der niederlandischen Volksliteratur alterer Zeit* (1838), and Winkler, *Algemeen nederduitsch en friesch Dialecticon* (1872). For the study of the language, see grammars by Rask, Grimm, Heyne, and A. H. Cummins (2d ed. Lond. 1888), grammars, dictionaries, &c. by Richthofen (1840), J. Halbertsma (1874), Cadovius Muller (died 1725), Ten Doornkaat Koolman (1877–85), Dirksen (1889), Outzen (1837), Bendsen (1860), and Johansen (1862).

Frit (*Chlorops frit*), a small black Dipterous corn-fly, common in North Europe, not known in Britain, doing great damage especially to barley (see CORN INSECTS).

Frith. See FIRTH.

Frith, JOHN, reformer, was born about 1503 at Westerham, Kent, and from Eton passed to King's College, Cambridge, whence in 1525 Wolsey summoned him to his new foundation at Oxford. A twelvemonth later, however, suspicion of heresy drove him a fugitive to the young Protestant university of Marburg, and during his five years' stay here he saw much of Tyndale and Patrick Hamilton, and wrote several Protestant treatises. Venturing back to England in 1532, he was seized and lodged in the Tower, and on 4th July 1533 was burned at Smithfield. He has been called the author of the Anglican doctrine of the Eucharist.

Frith, WILLIAM POWELL, R.A., was born at Aldfield, Yorkshire, on the 9th January 1819. He studied art at Sass's Academy, London, and in the schools of the Royal Academy; and in 1840 exhibited his 'Othello and Desdemona' in the British Institution. He painted portraits, and his early subject-pictures were scenes from the English and French classics. His 'Coming of Age in the Olden Time' first brought its painter into notice, and his celebrity was increased by 'Ramsgate Sands' (1854); 'The Derby Day' (1858); and 'The Railway Station' (1862). His later works include 'Charles II.'s Last Sunday' (1867); 'Before Dinner at Boswell's Lodgings' (1868), which in 1875 sold for £4567; the gambling subjects entitled 'The Road to Ruin' (1878); and 'A Private View, a Scene at the Royal Academy' (1883). His productions, while destitute of the finer artistic qualities, have been extremely popular on account of the interest of their subjects and their obvious dramatic point, and have become widely known by means of engravings. He was elected A.R.A. in 1846, R.A. in 1852, and put on the retired list in 1890. His popular picture, *The Railway Station*, sold for £5250, was resold in 1890 for £315. His *Autobiography* (3 vols.) was published in 1887–88.

Common Fritillary (*Fritillaria meleagris*).

Frithiof. See TEGNER.

Fritillary (*Fritillaria*), a genus of the Liliaceæ, closely allied to the lily and tulip, are herbaceous and bulbous-rooted plants. About

Crown Imperial (*Fritillaria imperialis*): *a*, flower enlarged.

twenty species are known, all palæarctic. All of them have drooping flowers; some of them are

beautiful. One species only is a native of Britain, the Common Fritillary (*F. meleagris*), also called Snake's Head, Chequer-flower, &c., which is found in meadows and pastures in the east and south of England, flowering in April or May. They are specially plentiful in the Magdalen water-meadows, Oxford. The flowers are pale or dark purple, tesselated with dark markings, sometimes cream-white. Many varieties are in cultivation.—This genus includes the Crown Imperial (*F. imperialis*), which was brought from Persia to Constantinople in the 16th century, and thence introduced through the imperial garden at Vienna into western Europe, where it soon became a constant inmate of the herbaceous border. The bulb of the common species, but still more of this one, is poisonous.

Fritillary, a name given to a number of butterflies (Argynnis, Melitæa, &c.), some of which are common in Britain, from the resemblance of the colouring on the upper surface of their wings to that of the flowers of the common fritillary.

Friuli (Ger. *Friaul*, Lat. *Forum Julii*), the name of a district formerly governed by independent dukes, lying at the head of the Gulf of Venice. With a total population of about 700,000, and a total area of some 3470 sq. m., it is divided between Austrian Friuli, embracing the districts of Görz, Gradisca, and Idria, and Italian Friuli, including the province of Udine and the district of Portogruaro. Friuli is rich in corn and wine, and has much metallic wealth and numerous mineral springs. The inhabitants, called *Furlani*, are mostly Italians, some of them speaking a peculiar dialect containing several Celtic elements. Friuli constituted one of the thirty-six duchies into which the Lombards divided the north of Italy, and shared the vicissitudes of its neighbour states.

Frobenius, JOANNES, the learned printer, was born in Franconia in 1460, founded a printing-office at Basel in 1491, and published a Latin Bible, editions of Cyprian, Tertullian, Hilary, Ambrose, and the Greek New Testament (1496). As correctors to the press he employed such men as Œcolampadius and Erasmus; and between 1491 and 1527, the year of his death, he issued 300 works (including all those of Erasmus), well printed and wonderfully free of error.

Frobisher, SIR MARTIN, one of the great Elizabethan seamen, was born in Yorkshire, either at Altofts (near Wakefield) or at Doncaster about 1535. Sent to sea as a boy, he traded to Guinea and elsewhere, and seems at an early age to have become possessed by his life-long dream of a north-west passage to Cathay. After long solicitations he was enabled, chiefly by help of Warwick, to set sail northwards round the Shetland Islands, 7th June 1576, with the *Gabriel* and the *Michael* of 20 tons each and a pinnace of 10 tons, with a total complement of thirty-five men. The pinnace was soon lost in the storms that followed, and the *Michael* deserted, but Frobisher held on his adventurous course, was almost lost on the coast of Greenland, and reached Labrador on the 28th July. From Hall's Island at the mouth of Frobisher Bay his men carried away some 'black earth,' which was supposed in London, whither he arrived on October 9th, to contain gold. Next year a new expedition was fitted out with much enthusiasm, the queen herself supplying from the royal navy a vessel of 200 tons. The country around Hall's Island was formally taken and named *Meta Incognita*, and abundance of the black earth was brought to England. Yet another and well-appointed expedition was despatched in 1578, but was harassed by storms without and dissensions within, and returned home with a great cargo of the ore, from which, however, no more gold could be extracted. Of Frobisher we hear but little during the next few years, but in 1585 he commanded a vessel in Drake's expedition to the West Indies, did good service in the preparatory task of hampering the designs of Spain, and in the struggle with the Armada covered himself with glory by his conduct in the *Triumph*, and was rewarded by the honour of knighthood. Frobisher next married a daughter of Lord Wentworth, and settled down as a country gentleman, but was soon again at the more congenial task of scouring the seas for the treasure-ships of Spain. At the siege of Crozon near Brest in the November of 1594 he received a wound of which he died at Plymouth on the 22d of the same month. His *Three Voyages* were edited by Admiral Collinson for the Hakluyt Society (1867). There is a Life by Rev. F. Jones (1878).

Frobisher Bay, an inlet opening westward near the mouth of Davis Strait into the territory called by Frobisher *Meta Incognita*, at the southern end of Baffin Land. It is about 200 miles long by above 20 wide, with rugged mountainous shores. It was till Hall's voyage called Frobisher *Strait*, being erroneously regarded as a passage into Hudson Bay.

Froebel, FRIEDRICH WILHELM AUGUST, German educational reformer, was born at Oberweissbach in Thuringia, 21st April 1782. His studies at Jena being interrupted by the death of his father in 1802, he was compelled to shift as best he could for a living, until in 1805, at Frankfort-on-the-Main, he found his true vocation in teaching. The next five years he spent partly at Frankfort, partly at Yverdon in Switzerland, at the latter place in close intimacy with Pestalozzi. Then for a couple of years he resumed his studies, this time chiefly in the natural sciences, at Göttingen and Berlin. But again they were interrupted: the War of Liberation broke out, and Froebel joined Lützow's corps. Two years after the conclusion of peace he got his first opportunity to realise his long-meditated principles of education; he made a start at Griesheim in Thuringia, but in the following year (1817) transferred his school to Keilhau, where he was shortly afterwards joined by his devoted friends and disciples, Langethal and Middendorff. At this time the characteristic idea of his teaching was that the root of all educational development is action, which has for its ultimate aim not only mere physical exercise, but also the unfolding and strengthening of the mental powers; and underlying this was the conviction that the real purpose of education should be to encourage the child to grow naturally and spontaneously, unfolding all its powers according to the inner organic laws of its being, just as grow plants and animals and crystals. In 1826 he expounded his views in a work entitled *Die Menschenerziehung*. With the view of extending his system, Froebel in 1831 established a branch institution in the canton of Lucerne in Switzerland, which, however, could never make headway against the opposition of the Roman Catholic clergy. Hence, after starting an orphanage at Burgdorf in Bern, where also he began to train teachers for educational work, Froebel returned to the centre of Germany, and in 1836 opened at Blankenburg, not far from Keilhau, his first Kindergarten (q.v.) school. The rest of his life was spent in the advocacy of kindergarten schools and in organising them; but along with these labours he combined the training of teachers to carry on the system he had devised. He died on 21st June 1852 at Marienthal in Thuringia. Froebel's works were collected and published by Wichard Lange in 1862–63 (new ed. 1874), also by Seidel in 1883. See *Autobiography of F. Fröbel*

(Lond. 1886); *Life of Fechel*, by Emily Shirreff (Lond. 1887); and his *Letters*, translated by Moore and Michaelis (1890).

Frog, a genus (Rana) of tailless Amphibians; but the name, usually with some prefix or other, is often extended to the members of related genera or even of related families—e.g. to the obstetric frog (Alytes), to the tree frogs (Hylidæ), or to the peeping frogs (Hylodes). The common frog in Britain is *Rana temporaria*, distinguished from the edible frog, *R. esculenta*, which has been introduced into Britain, by slight differences in colouring, by the presence of a dark, triangular patch extending backwards from the eye, and by the absence of the dilatable sacs (at the back corners of the mouth) which intensify the croaking of the 'Cambridgeshire Nightingales.' The general shape is an elongated oval, of which the head occupies about a third; a hump on the back marks the end of the distinct vertebræ and the beginning of an unsegmented portion known as the urostyle. The tail has completely disappeared, the young animal having literally lived upon it during part of its

Common Frog (*Rana temporaria*).

metamorphosis. The arms are short, the fingers four and unwebbed, and the innermost is swollen in the males; the hind-legs are long and muscular, well adapted for both leaping and swimming, with an elongated ankle, five webbed toes, and an internal 'tarsal tubercle' like a hint of a sixth. The skin is soft and glandular, with pigment cells admitting by their changes of a slight alteration in colour. The external nostrils are situated near the tip of the snout; the eyes have a movable lower lid; the tympanum or drum of the ear is readily seen somewhat farther back.

General Life.—The frog, aquatic in its youth, generally remains near water. In dry weather it hides itself, and great numbers are often seen to issue forth on the welcome return of rain. Their leaping and swimming deftness need no remark. The adults feed upon living animals, insects, and slugs. These are caught on the large viscid tongue, which being fixed in front of the mouth and free behind, can be thrown rapidly outwards, and even more rapidly retracted. In winter the frog 'hibernates' or lies torpid, buried in the mud at the bottom of the pool, and great numbers of individuals may be dug up in winter all clustered together. During this season certain 'fatty bodies,' situated on the top of the reproductive organs, and apparently degenerate portions of the kidney, become reduced in size, being probably the ovaries and testes, which become functional in the month of March. Then it is that the frogs congregate together for breeding purposes, and that the males with their vigorous croaking serenade their more weakly-voiced mates, preceding the birds in announcing the approach of spring. The titles bull-frog, blacksmith-frog, sugar-miller, &c., applied to certain species, obviously refer to their notable vocal powers.

The frog generally contains some interesting parasites—a hermaphrodite threadworm or Nematode (*Angiostomum nigrovenosum*) in the lungs, a fluke or Trematode with many suckers (*Polystomum integerrimum*) in the bladder, and a ciliated Infusorian with many nuclei (*Opalina ranarum*) in the hindmost part of the alimentary canal.

Life-history.—The eggs of the frog are familiar to almost all; each is a little dark ball enclosed in a glutinous sheath which swells in the water into a clear round globe. The egg has most black pigment in its upper half, the heavier yolk sinking for the most part to the lower hemisphere. They are fertilised just as they leave the female, which the male is at the same time embracing. The division of the ovum is complete but unequal, the upper hemisphere with the 'formative protoplasm' soon exhibiting a larger number of smaller cells than the lower portion, which chiefly consists of yolk to be gradually absorbed by the embryo (see EMBRYOLOGY).

By the tenth day after the eggs are laid the head, body, and tail of the young frog may be distinctly seen. Following the lines of its ancestral history (*why* or *how* is a difficult question), the animal becomes fish-like, with a long tail and with three pairs of external gills on its neck. About a fortnight after the laying the young tadpoles are hatched, and, jerking themselves out of the gelatinous mass, swim freely in the water. They are still mouthless, and live on their still unexhausted capital of yolk. They have a paired sucker underneath their head, by means of which when tired they attach themselves to water-weeds or other objects. In a few days, however, they gain a mouth, 'bordered by a pair of horny jaws, and fringed with fleshy lips provided with horny papillæ.' The whole arrangement reminds one of that of the lamprey. As the tadpole hungrily feeds on fresh-water weeds (algæ, &c.), the hitherto short alimentary canal becomes elongated, furnished with a liver and pancreas, and, when the animal is big enough to dissect, may be readily seen coiled up like a watch-spring. About the time when mouth and anus have been opened the four gill-slits or clefts, opening from the pharynx to the exterior, may also be seen, and very soon the original external gills shrivel, and are replaced by an internal set. As the latter develop, a fold of skin grows over them, forming a gill-chamber which by-and-by closes so much that only a single exit aperture remains, and that on the left side. Through this the water taken in for respiration by the mouth passes to the exterior, after washing the gills on its way.

The tadpole thrives on its vegetarian diet, and rapidly grows bigger and stronger; the large tail is a powerful swimming organ, and the adhesive suckers are less and less used. The limbs bud forth, but the anterior pair, hidden by the gill-covers above referred to, are longer of becoming distinctly visible. By the end of the second month the tadpole has attained to the level of the double-breathing fishes or Dipnoi (see FISHES); in other words, the lungs become useful, the gills for a while persist, but, as the animals get into the habit of coming oftener to the surface to breathe, these latter organs gradually degenerate.

Two or three weeks more, and a remarkable change—a metamorphosis—occurs, in which the tadpole rises above the fish level and becomes a distinct amphibian (see AMPHIBIA, for figures, &c.). The tadpole ceases to feed upon algæ, and begins to live at the expense of its tail, from which

wandering blood-cells or 'leucocytes' carry the nutriment to other parts of the body. A casting of the outer layer of skin takes place; the gills are finally lost; 'the horny jaws are thrown off; the large frilled lips shrink up; the mouth loses its rounded suctorial form and becomes much wider; the tongue, previously small, increases considerably in size; the eyes, which as yet have been beneath the skin, become exposed; the fore-limbs appear, the left one being pushed through the spout-like opening of the branchial chamber, and the right one forcing its way through the opercular fold, in which it leaves a ragged hole' (Milnes Marshall). As these momentous changes progress, and as the supply of food afforded by the tail begins to be exhausted, the animal recovers its appetite, but this time carnivorously, feeding on available animal matter, or even on its fellows. At this stage tadpoles will clean a skeleton beautifully, and Buckland describes them as showing a great avidity for animal food, crowding round a dead kitten, and nibbling at the toes of little boys who wade in pools where they abound. With the change of diet the abdomen shrinks, stomach and liver enlarge, the intestines become both narrower and shorter. The tail shortens more and more till it is completely absorbed; the hind-limbs lengthen; and eventually the animal leaps ashore—a tiny frog. For a considerable time the tadpole appears to be neither male nor female, but differences in nutrition, &c. decide the question of sex. In ordinary circumstances there are about as many males as there are females, but Jung has shown that by increasing the quality of food from fish to beef, from beef to frog flesh, he could increase the percentage of females to about ninety. See EMBRYOLOGY, ENVIRONMENT, REPRODUCTION, SEX; while for details of life-history, Milnes Marshall's book should be consulted.

Distribution and Related Species.—The common Brown Frog (*R. temporaria*) is widely distributed in Europe and Asia; 'it is the most northerly of known species, ranging in Norway to beyond the seventieth parallel of latitude. In the Alps it still frequents the waters at an elevation of 8000 feet.' It is of course abundant in most parts of Britain, and is common enough in Ireland, where, however, it is said to have been introduced in 1696.

Of wider distribution is the Green or Edible Frog (*R. esculenta*), which also occurs in Britain, though not believed to be indigenous. Its habitat extends from Scandinavia to North Africa, from France to Japan. Widely distributed in the United States are two forms—the Shad- or Leopard-frog (*R. halecina*) and the Wood-frog (*R. sylvatica*)—which some regard as identical with our common species. The common Bull-frog of North America (*R. catesbiana*) is often brought to European zoological gardens, has an appetite big enough to engulph a sparrow, and a croaking power proportionate to its large size. Like the edible frog on the Continent, it is not unfrequently cooked. A large Indian species (*R. tigrina*), another relatively huge, toad-like species (*R. adspersa*) from tropical Africa, a single species from West Australia (*R. papua*), and another solitary form (*R. krefftii*) from the Solomon Islands deserve to be mentioned. The genus is unrepresented in the southern parts of South America and in New Zealand.

Related Genera.—The family of true frogs or Ranidæ includes about two hundred species, ranked in eighteen genera. They have always teeth in the upper jaw, and a certain technical peculiarity in the breastbone. One of the most curious forms (which have always teeth in the upper jaw) is the arboreal genus Rhacophorus, the 'flying frog' described by Wallace, in which the webs between both fingers and toes are much developed. The tips of the fingers are dilated, and serve for attachment to smooth or vertical surfaces. The arboreal habit is a resource which brings with it several physiological adaptations, which must not be too much insisted upon in classification, for, as Huxley observes, the common brown frog 'at a year old will climb up the vertical side of a glass vessel, flattening out the ends of its toes, and applying its belly against the surface of the glass, like a tree-frog.' Frogs, like other amphibians, are usually unrepresented in oceanic islands, but, besides the species of Rana already mentioned as occurring in the Solomon Islands, three forms of Cornufer, ranked among the Ranidæ, ought to be noted on account of their habitat in the Fiji Islands. The Dendrobatidæ form a family of small tree-frogs nearly allied to the Ranidæ, but without teeth. From one species (*D. tinctorius*) the savage tribes of some parts of South America are said to extract a deadly poison for their arrows. Less nearly allied to the Ranidæ are the toothless toads (Bufonidæ), the horned toad (Ceratophrys), the true tree-frogs (Hylidæ), the 'midwife-toad' or obstetric frog (*Alytes obstetricans*), the tongueless Surinam toad (*Pipa americana*), which are separately discussed (see TOAD, TREE-FROG, &c.).

The use of frogs for food is regarded with unnecessary prejudice in Britain, but is very common on the continent of Europe. The species chiefly used is the edible frog (*R. esculenta*), which greatly abounds in ponds and slow streams in France, southern Germany, and Italy. They are taken for the market by nets and by a kind of rake, and are sometimes specially fattened in preserves. The hind-legs are most frequently cooked, but other muscular parts may be utilised. They are usually dressed with sauces, and in flavour and tenderness are comparable to chicken. The African species (*R. adspersus*) is said to be much used by the native tribes, and the gigantic bull-frog figures as a rarity in the transatlantic menu. The frog furnishes a very convenient vertebrate type to the comparative anatomist, embryologist, and physiologist, and is in this connection much more useful than on the dining-table.

See AMPHIBIA, BULL-FROG, NEWT, TOAD, TREE-FROG; and for showers of frogs, SHOWERS. See also St George Mivart, *The Common Frog* ('Nature' series, Lond. 1874); A. Milnes Marshall, *The Frog: an Introduction to Anatomy, Histology, and Embryology* (3d ed. 1888); Ecker and Wiedersheim, *Anatomie des Frosches* (3 parts, 1864, 1881, 1882; trans. by Haslam, 1889); for figures, G. B. Howes, *Atlas of Practical Elementary Biology* (1885); Bell's *British Reptiles* (1839); Leydig's *Anura Batrachia d. Deutschen Fauna* (Bonn, 1877); Hoffmann in Bronn's *Thierreich*, VI. (1873-78); British Museum Catalogue of Amphibia; and Hatchett Jackson and Rolleston, *Forms of Animal Life* (1888).

Frog, FISHING. See ANGLER.

Frogbit (*Hydrocharis morsus-ranæ*), a small aquatic plant of the order Hydrocharidaceæ, allied to the water-soldier (Stratiotes), but with floating leaves.

Frogged, a term used in regard to uniforms, and applied to stripes or workings of braid or lace, as ornaments, mostly on the breast of a coat.

Frogmore, an English royal palace and mausoleum in the park of Windsor, Berkshire. The palace was purchased by Queen Charlotte in 1800. The mausoleum, a Romanesque edifice, cruciform in shape and surmounted by an octagonal dome, is consecrated to the memory of the Prince Consort, whose remains were transferred to it in 1862; and here the remains of Queen Victoria were deposited in 1901.

Frog-spit, or CUCKOO-SPIT. See FROTH-FLY.

Frohsdorf, a village in Lower Austria, 30 miles S. of Vienna, on the river Leitha, and near

the frontiers of Hungary. It is celebrated for its splendid castle, which acquired a kind of political importance from having from 1844 till 1883 been the rendezvous of the elder Bourbon party and the residence of the Comte de Chambord (q.v.).

Froissart, JEAN, was born at Valenciennes about 1337. His father was a painter of armorial bearings. He was educated for the church, but spent his youth in gaiety and dissipation, being, by his own confession, a dear lover of dances and carolling, of minstrelsy and tales of glee. 'My ears,' he says, 'quickened at the sound of uncorking the wine-flask, for I took great pleasure in drinking, and in fair array, and in delicate and fresh cates.' When he was twenty years of age, he began, at the command of his 'dear Lord and Master, the Sieur Robert of Namur, Lord of Beaufort,' to write the history of the wars waged during his days in France, England, Scotland, and Spain. The first part of his Chronicle, which deals with the events of the years 1326–56, was principally compiled from the writings of one Jean le Bel, Canon of Liége. Having completed this section of his work in 1360, Froissart set out on his long travels in quest of adventure and good company, and that brilliant spectacle of martial and courtly pageantry in which all through his life he found unsating delight. The first country which he visited was England, where he received a gracious welcome from Philippa of Hainault, the wife of Edward III. Philippa appointed him her secretary or clerk of her chamber, a post which he held for some years, but which he resigned on account of a hapless passion for a lady of Flanders. In 1364 he travelled through part of Scotland, riding, he informs us, on a grey palfrey with his valise behind him, and having a white greyhound as his only companion. His reputation as a poet and historian, his gay and courteous converse, secured him an honourable reception in Scotland as elsewhere. He was the guest of King David Bruce, and was entertained for fifteen days at Dalkeith Castle by William, Earl of Douglas, the exploits of whose house he has frequently celebrated in his Chronicle. In 1366 he journeyed to Aquitaine in the retinue of the Black Prince, who would not, however, allow him to accompany the Spanish expedition, but sent him back to his patroness, Queen Philippa. Two years later we find him in Italy, where he was present, along with Chaucer and Petrarch, at the marriage of Lionel, Duke of Clarence, son of Edward III., with Jolande of Milan, the daughter of Galeazzo Visconti. For a time he settled at Lestines, in the diocese of Liége, where he obtained a curacy, and where he confesses 500 francs very quickly passed from him to the vintners. 'It may be conjectured,' says Sir Walter Scott, 'that *they* were more obliged to his attention than any of his other parishioners.' Before 1384 he had attached himself to Wenceslas, Duke of Brabant, whose verses he collected along with certain pieces of his own, under the title of *Meliador, or the Knight of the Golden Sun*. On the death of Wenceslas, Froissart repaired to the court of Guy, Count of Blois, who persuaded him to devote himself to his Chronicle. The second volume of the work was finished about 1388, and about the same date its author set out from Blois on a visit to Gaston Phébus, Count de Foix. This journey, of which he has left a very entertaining record, he performed in the company of the good knight Espaing de Lyon, who told him of the deeds of emprise that had lately been done at the various towns and castles by which they passed in the course of their wayfaring. After making a long sojourn at Orthez with the Count de Foix, of whose court he has left us a description which is equally vivid and charming, Froissart, about the year 1390, settled for a while in Flanders, and resumed work on his Chronicle. In 1395 he again yielded to the old roving impulse. He revisited England, was cordially welcomed by King Richard II., and remained abroad for about three months. He then returned to Chimay, where he had obtained a canonry, and where he ended his days in 1410.

Froissart's famous book deals with the period between 1326 and 1400. Mainly occupied with the affairs of France, England, Scotland, and Flanders, he likewise supplies much valuable information in regard to Germany, Italy, and Spain, and even touches occasionally on the course of events in Hungary and the Balkan peninsula. Except in the first part of the work, he made little use of the writings of others. An historian-errant, he gathered his materials in courts and on highways, from the lips of the lords and knights, the squires and the heralds whom he encountered. The charm of his book is perennial. He is of all medieval chroniclers the most vivid and entertaining. 'His history,' says Sir Walter Scott (who called the work his *liber carissimus*), 'has less the air of a narrative than of a dramatic representation.' He was a born story-teller; his pages glow with colour; his narrative glides easily and gracefully along; and he is, on the whole, accurate and impartial in his statements. 'In certain of his battle-pieces,' says Villemain, 'Froissart's style is truly Homeric,' and the tribute is justly merited. The main defects in his work are the frequent repetitions and the negligent arrangement of the facts. He has been reproached for not having espoused the cause of the French against the English, as if it were to be expected that a Flemish priest, in his youth the favourite and secretary of Edward III.'s queen, should share the burning patriotism, the intense hatred of England that animated such writers as Alain Chartier and Eustache Deschamps. More plausibly might he be arraigned for indifference to the sufferings of the townsmen and peasants. He is enamoured of the pageants of chivalry, engrossed in the deeds of nobles and knights. Few historians have been less critical or so uniformly delightful.

The chronicle was edited by Buchon (15 vols. 1824–26) and Luce (8 vols. 1869–88); translated by John Bourchier, second Lord Berners, 1467–1533 (published 1523–25; ed. by Utterson, 1812, and modernised by G. J. Macaulay; new trans. by Colonel Johnes, 1803–5). Buchon edited Froissart's ballades, rondeaux, virelais, &c., which introduced a Provençal element into northern French literature, in 1829: *Meliador* was discovered in 1894. See monographs by Kervyn de Lettenhove (Paris, 1858), Weber (German, 1871), and Mme. Darmesteter (Paris, 1894; trans. 1895).

Frome, or FROME SELWOOD, a market-town of Somersetshire, on the Frome, a branch of the Avon, 12 miles S. of Bath (19 by rail). The surrounding country is very picturesque, and the town, until modernised early in the 19th century by the formation of two wide thoroughfares, was a quaint old place, with narrow, crooked, steep streets. Its parish church is a fine Decorated building splendidly restored by the late Rev. W. Bennett (q.v.), with a spire 120 feet high, stations of the cross, and the grave of Bishop Ken. Frome's specialties are broadcloths and other fine woollens, and it also produces cards for dressing cloth, ale, silk, &c. Pop. (1851) 10,148; (1891) 9613. Till 1885 Frome returned one member to parliament. The once celebrated forest of Selwood was in the vicinity.

Fromentin, EUGÈNE, painter and author, was born at La Rochelle in 1820. He studied under Cabat the landscape-painter; and from 1842 to 1846 travelled in the East, which is the scene of almost all his works. His pictures are admirably true in their local colouring, and reproduce with

great spirit the free nomad life of the Arab and his steed. Among his more important works are 'Arabs attacked by a Lioness' (1868), 'Halt of the Muleteers' (1869), 'A Souvenir of Esneh' (1876), and 'The Nile' (1876). His 'Couriers,' 'Country of the Ouled-Nayls,' 'Springtime' (1861), and his 'Falconry in Algiers: the Quarry' (1863) are in the Louvre. But he was no less prolific with his pen than with his brush. He published an account of his travels in *Le Pays*, under the titles of 'Visites Artistiques' and 'Simples Pèlerinages' (1852–56); and 'Une Année dans le Sahel' (1858) recorded the results of his investigations for the Committee of Historic Monuments. He also produced a successful romance, *Dominique* (1863). English translations of his *Les Maitres d'Autrefois* (1876), an admirable criticism upon the Dutch and Flemish painters, as well as of his Life by Louis Gonse (1881), have been published in America. He became a 'chevalier' of the Legion of Honour in 1859 and an 'officier' in 1869; and died at St Maurice, near La Rochelle, 27th August 1876. See Gonse, *Eugène Fromentin* (Paris, 1881).

Frond, in Botany, a term often used to designate the leaves of cryptogamous plants. It was originally introduced as distinctive of organs in which the functions of stem and leaf are combined. The term *leaf* is now very generally used even of mosses, ferns, &c., and the term *thallus* is applied to liverworts and lichens. In the case of many Algæ the term is often used to designate the whole plant except its organs of reproduction.

Fronde, the name (indicating the sling used by the boys of Paris in their mimic fights) given to certain factions in France during the minority of Louis XIV., which were hostile to the court and the minister, Mazarin, and gave rise to a series of civil dissensions from 1648 to 1654. The grasping and despotic policy of Mazarin, to whom Anne of Austria, the queen-regent, had abandoned the reins of government, had given offence to all classes. The entire nation was aflame with discontent: the nobles were jealous of the employment of foreigners in the chief offices of state; the people kicked against the oppressive taxation; the parliaments resented the wilful disregard of their authority. At length the parliament of Paris refused to register the royal edicts, more especially the financial measures increasing the burdens of taxation. Mazarin in retaliation ordered the arrest (26th August 1648) of the president and one of the councillors, Peter Broussel. Thereupon the people took up arms. The court fled to Ruel in October, but early in 1649 removed to St Germain. The populace and parliament were joined by the discontented nobles, Conti, Longueville, Beaufort, Turenne, and De Retz. But the arrival of Condé, the champion of the royal party, who proceeded to lay siege to Paris, soon turned the tide. An agreement was therefore come to between court and parliament at Ruel on 1st April 1649, the people being released from the obnoxious taxes, whilst Mazarin and the foreigners were allowed to retain their offices. This ends the movement called the Old Fronde, a contest carried on in the interests of the people. The New Fronde was at bottom a struggle between Condé and Mazarin. The nobles, especially Condé, were far from being satisfied with the compact of Ruel, and opened negotiations with Spain for assistance from the Netherlands. But on the 18th January 1650 the queen-regent suddenly arrested Condé, Longueville, and Conti. This arbitrary proceeding roused the provinces. The Duchess of Condé stirred up the south of France. The Duchess of Longueville (Condé's sister) won over Turenne, who threatened Paris, but was defeated at Rethel. Nevertheless the storm was so great that Mazarin was obliged to release the princes, and flee from the country. Now, however, a kaleidoscopic movement changed the relations of the principal actors in the affair. Condé withdrew to Guienne: De Retz was bribed by the gift of a cardinal's hat; Turenne went over to the court; and Mazarin was recalled and reinstated in power. Meanwhile, Louis XIV., who, having now attained his fourteenth year, was declared to be of age, endeavoured to induce Condé to return; but the latter, mistrusting these overtures, commenced a regular war against the court, until he was defeated by Turenne near Paris on 2d July 1652. Condé found refuge within the capital; but the citizens, grown weary of the whole business, opened negotiations with the king, only demanding the removal of Mazarin to return to their allegiance. This demand was complied with and a general amnesty proclaimed (1653). Condé, who refused to enter into the compact, repaired to Champagne; but, finding no one disposed to take up arms in his cause, he entered the Spanish service. Shortly afterwards Mazarin was once more recalled to Paris, and again entrusted with the reins of government. The parliament of Paris was completely humbled, so much so that its political existence was virtually suspended for a century and a half. Thus the royal power came forth victorious from the contest.

See Ste-Aulaire's *Histoire de la Fronde* (2d ed. 1860), Bazin's *France sous Louis XIII.* (2d ed. 1846), Fitzpatrick's *Great Condé and the Fronde* (1873), the work by Capefigue (1835), and two by Chéruel (1880 and 1882).

Frontenac, Louis de Buade, Comte de, governor of New France, was born in 1620, entered the army in 1635, and at an early age became brigadier. In 1672 he was appointed governor of the French possessions in North America, to be recalled ten years later, in consequence of endless quarrels with his intendant and the Jesuits; but in spite of his violent temper he had gained the confidence of the settlers and the respect of the Indians, and in 1689, when to the horror of constant attacks from the Iroquois the misery of a war with England was added, he was again sent out by the king, as the only man who could rouse the despairing colonists to hope and action. During the next nine years he loosed his savage allies on the defenceless villages of New England, repulsed a British attack on Quebec, and so broke the power of the Iroquois that they were never again a terror to the colony. He died at Quebec in 1698. See Francis Parkman's *Count Frontenac and New France under Louis XIV.* (Boston, 1877).

Frontinus, Sextus Julius, a Roman author and administrator who flourished in the second half of the 1st century. In 75 A.D. he was appointed governor of Britain, where he conquered the Silures, and vigorously maintained the imperial authority. He was twice consul in the course of his life, and in 97 was made superintendent of the water-works at Rome. He died about 104. Several works are attributed to Frontinus, only two of which are certainly genuine, the *Strategematicon*, a treatise on the Art of War, in four books, and the *De Aquis Urbis Romæ*, in two. His works have been edited by Dederich (Leip. 1855).

Fronto, Marcus Cornelius, Latin rhetorician, was born at Cirta, in Numidia, about 100 A.D. In consequence of his reputation as an orator and pleader, he was entrusted by Antoninus Pius with the education of Marcus Aurelius and Lucius Verus. In 143 he was consul. He died about 170. The two series of Fronto's letters to Marcus Aurelius, discovered by Mai in 1815, do not bear out the reputation for eloquence and intellectual force ascribed to the rhetorician by his contemporaries.

A critical edition was published by Niebuhr in 1816, and another by Naber in 1867.

Frosino'ne (*Frusino* of the Volscians), a town of Italy, 60 miles SE. of Rome by rail, with remains of an ancient amphitheatre. Pop. 7018.

Frost. The term frost is used to describe the condition of bodies containing moisture when their temperature is below 32° F., the freezing-point of water. When the substance in question is the air, everything exposed to its influence and not otherwise heated passes also below the freezing-point. In no part of the British Isles, within 1000 feet of sea-level, is the average temperature at any time of the year below 32°; and therefore the frosts experienced in Britain, though often lasting several days or even weeks, are essentially sporadic and of the nature of interruptions in the general character of the weather. It may be noted in passing that when severe frosts do occur, covering the rivers and lakes with ice, the weather is usually settled, there being a high barometer and little wind; so that the air over the British Isles or those parts of them where the frost prevails is not liable to be mixed with air from the warmer regions above the seas around. Loch Ness is one of the few lakes in Britain never known to freeze: its great depth prevents the cold having time to cool the whole mass of the water even in the longest and severest frosts that have occurred within the memory of man. Other large but shallower lakes, such as Loch Lomond, on the contrary get sufficiently frozen over to bear skaters and curlers during every exceptionally cold winter. A frequent and disagreeable effect of frost is the bursting of water-pipes, due to the expansion of water in the act of freezing. The breakage is not usually noticed till a thaw sets in and the water again circulates in the pipe, hence it is sometimes erroneously supposed that the thaw has burst the pipe.

Local low temperatures are often found in valleys when the air at a little height up is considerably warmer, producing what is known as an 'up-bank thaw.' This is caused by the air chilled by radiation from the sides of the hills settling down from its greater weight, and occurs on every night when there is not enough wind to mix the different layers together. In fact, on calm mornings a stream of cold air flows down valleys like their rivers, and often indicates its presence by the fog caused by its coming in contact with the damp air above the watercourses. In choosing sites for houses or gardens a less liability to great cold and damp fogs will be secured by placing them on knolls or a little up the sides of the hill than if they are planted in the bottom of the valley, and thus in the influence of this cold current. A position directly opposite the mouth of a valley is also to be avoided.

Frost may be present on the ground or on plants when the air is several degrees above the freezing-point. This hoar-frost is due to cooling by radiation (see HEAT, p. 609)—i.e. to the ground, leaves, &c. radiating their heat away faster than it can be replenished from the air around. Hoar-frost is most liable to occur on clear nights, clouds acting as a screen to check radiation, and is more common in country districts than in towns, where the smoke serves a similar purpose. It is the frost most dangerous to vegetation—coming as it does in clear weather when the air is otherwise warm, the days often hot from strong sunshine, and the tissues of the plants full of sap. It may sometimes be foretold by observing the hygrometer; if the dew-point (see DEW) is below 32° in the afternoon, hoar-frost may be expected at night. At the same time it is frequently a sign of warm days, as the low dew-point indicates that little moisture is present in the air to check the sun's rays. Hoar-frost being wholly due to radiation, it is a common custom to protect plants by spreading some light covering over them, or even by burning leaves, brushwood, &c. to make a smoke of sufficient density to act as a screen. This is usually effectual, but may fail either from the air cooling below 32°, in which case the covering is almost useless; or by injuriously checking the circulation of air and confining a small quantity immediately over the plants, which, getting cooled by contact with the ground below the temperature of the free moving air around, may pass below 32° and allow the vegetation to be frost-bitten.

A well-known form of frost, closely allied to hoar-frost, is the crystalline deposit seen when the moisture in the air of a warm room condenses on the glass of the window. It takes most beautiful and varied forms, owing to the tendency of ice deposited in this manner to form hexagonal crystals.

Another form of deposition is fog-crystals, which appear whenever a frosty fog is accompanied by wind, the fog drifting along and depositing spicules of ice on all surfaces exposed to it. As frosty fogs in low-lying districts occur usually in calm weather fog crystals are not often observed there, but are of frequent occurrence on hills, where the driving mists cover all projecting stones, trees, &c., with great masses of loose feathery crystals, often reaching a thickness of several feet. Great damage is sometimes caused to trees and shrubs by rain falling immediately after frost, before the ground and the air near it has time to thaw. The rain freezes as soon as it touches any objects, and gradually encrusts them with solid ice, until even large branches of trees break down under the weight. For other matters connected with freezing and its effects, see ICE, TEMPERATURE, THERMOMETER, GLACIER, HAIL, SNOW, FREEZING MIXTURES, &c.

Lists of the most memorable frosts on record will be found in W. Andrews's *Famous Frosts and Frost Fairs in Great Britain* (1887), and in C. Walford's paper on 'Famines' in *Journal of the Statistical Society* (1878). Fairs were held on the ice on the Thames in 1564, 1607–8, 1620, 1683–84 (especially celebrated), 1688–89, 1715–16, 1739–40, 1788–89, 1813–14. The western parts of the Baltic were frozen, and in most years passable for men and horses, in 1294, 1296, 1306, 1323, 1349, 1402, 1459–60, 1548, 1658, 1767. Flanders and Holland were visited by unusually severe frosts in 1468, 1544, 1565, 1594, 1622, 1734, and 1785. Besides these, other memorable frosts occurred in the years and countries mentioned in the subjoined table:

401, 763–4. Seas near Constantinople.	1737. Italy and Spain.
859–60. Mediterranean and Adriatic.	1740. Denmark and Prussia.
1035. On Midsummer Day in England.	1745. Russia.
1076–77. England.	1760. Germany.
1234. Mediterranean.	1768. Germany and France.
1420. Sea near Constantinople.	1766. Naples, Lisbon, Bavaria, and France.
1433. Germany.	1767. Italy and North Europe.
1594. Adriatic at Venice.	1783–84. Central Europe.
1622. Hellespont.	1812. Russia.
1670. Rhine frozen.	1815. Canada.
1691. Austria.	1849. Norway.
1695. Italy and Germany.	1873. France.
	1888. Blizzard (q.v.) in U.S.
	1895. Great Britain.

Frost-bite is caused by cold depressing the vitality of a part or the whole of the body. The frost-bitten part is at first blue and puffy, from the current of blood through it being much retarded; then, should the cold be continued, it becomes pallid, and the painful tingling gives place to numbness and insensibility, and finally to actual death or mortification, with a dark livid appearance of the part. Although a sudden violent application of cold may cause death of the tissues, by reducing the temperature to a degree incompatible with animal life, the most common cause of the destructive effects of frost-bite is undoubtedly the excessive

reaction which occurs on sudden removal of the cold, or the application of heat; this is especially the case with moist cold.

Baron Larrey believed that 'cold was merely the predisposing cause of frost-bite, and mentions that after the battle of Eylau the French soldiers did not experience any painful sensations during the severe cold varying from 10° to 15° below zero of Réaumur's thermometer; but, when the temperature rose from 18° to 20°, they felt the first sensations of cold, and applied for succour, complaining of acute pains in their feet, and of numbness, heaviness, and prickings in the extremities. The parts were scarcely swollen, and of a dull red colour. In some cases, a slight redness was perceptible about the roots of the toes, and on the back of the foot; in others, the toes were destitute of motion, sensibility, and warmth, being already black, and, as it were, dried.' Those of the men who indulged in the warmth of the bivouac fires suffered from frost-bite in much larger proportion than their more hardy comrades. But 'the extent of disaster from this cause even in modern campaigning may be judged from the fact that in the French army before Sebastopol 2800 cases occurred in two nights, and of this number 900 subsequently died.'

In Great Britain cases of frost-bite are comparatively rare. Occasionally, in severe winters, cases present themselves at the hospitals in the persons of houseless, ill-nourished unfortunates, whose constitutions have in many instances been enfeebled by spirit-drinking.

The treatment of frost-bite consists in coaxing back by degrees the vitality of the part; this is most prudently effected by rubbing the part in a cold room, at first with snow, then with water at ordinary temperature, and when warmth returns by enveloping it in cotton-wool or flannel without applying heat. As the coldness subsides, the painful tingling returns, then redness and heat; in a short time the latter will be above the natural standard, and, if the reaction is severe, the part will inflame, and perhaps mortify. It is well to remember that the part need not have been actually frozen for these symptoms to occur. The person with languid circulation who, coming home with cold wet feet, places them before the fire, or in warm water, may be 'frost-bitten' to all intents and purposes.

Frog-hopper (*Aphrophora spumaria*):
a, larva; *b*, perfect insect, with wing-covers closed; *c*, perfect insect, in the act of flight; *d*, the froth on a plant.

Froth-fly, also called FROTH-HOPPER, FROG-HOPPER, FROG-SPIT, common names for numerous insects parasitic on plants, on which the larvæ and pupæ are found surrounded by a frothy spittle. They are included in the family Cicadellidæ in the order Homoptera, and are related to the Aphides, Cicadas, and Lantern-flies. The family is a very large one; the members are all plant parasites, mostly small in size, often very beautiful in form and colour. The young stages, which are very like the adults, except in the absence of developed wings, suck their plant hosts, and thereupon surround themselves with the familiar froth which issues from the hind end of the gut. The froth is popularly called cuckoo-spit or frog-spittle, from fancies entertained as to its origin. It is sometimes so abundant, on willows for instance, that it drops from the branches. In some cases it may be helped by an exudation from the wounded plants. The adults have long hind-legs, and are able to hop about with some activity. The commonest British species, *Aphrophora spumaria*, is a yellowish-green insect, towards half an inch long, particularly addicted to willows; another common green form, *Tettigonia viridis*, is prevalent in meadows; *Cercopis sanguinolenta*, in red and black, also occurs; while Typlocyba, Jassus, and Ledra are abundantly represented in Europe. In tropical countries the Cicadellidæ are still more plentiful and beautiful. The nearly-related family Membracidæ includes many most extraordinary insects (see fig.)—e.g. in the genera Bocydium and Centrotus, with bizarre outgrowths from the first segment of the thorax.

Bocydium cruciatum. Bocydium globulare.

Froude, JAMES ANTHONY, an eminent English historian, was born at Dartington, near Totnes, Devonshire, 23d April 1818. The youngest son of the Archdeacon of Totnes, he was educated at Westminster and Oriel College, Oxford, took a second-class in classics in 1840, and in 1842 was elected a Fellow of Exeter College. He took deacon's orders in 1844, and was sometime under the spell of Newman's influence, but ere long his opinions underwent a fundamental change, as revealed to the world in 1848 in his outspoken book, *The Nemesis of Faith*, a work in which the solemnity and sadness of religious scepticism are relieved by a singularly tender and earnest humanity. The book was written with great and even startling power, and not only cost Froude his fellowship, but also an educational appointment in Tasmania. For the next few years he employed himself in writing for *Fraser's Magazine* and the *Westminster Review*, and in 1856 issued the first two volumes of his *History of England from the fall of Wolsey to the defeat of the Spanish Armada*, completed in 12 vols. in 1869. In this work Froude shows supreme literary ability—no reader can ever forget his narrative of the death of Mary Stuart and the disasters that befell the great Armada. In the art of making history as fascinating as fiction Macaulay is his only rival. But like him he is a man of letters first and an historian afterwards, and the defects of his merits have sadly impaired the permanent value of his work. As has been said with truth, he taught himself history by writing it; still his use of his materials never becomes critical, and his views of men and motives are always distorted by being seen through 19th-century spectacles, and these, moreover, spectacles of his own. Natural love of paradox and the faculty of seeing easily what he wished to see helped him to make a hero of Henry VIII.—the greatest blot upon his history. Four volumes of remarkably brilliant essays and papers, entitled *Short Studies on Great Subjects*, appeared between 1867 and 1882. Froude was elected rector of St

Andrews University in 1869, and received the degree of LL.D. For a short time he was editor of *Fraser's Magazine*. His next history, *The English in Ireland in the Eighteenth Century* (3 vols. 1871–74), showed the same merits and the same defects as the greater work, and the same may be said of his *Cæsar: a Sketch* (1879), a subject for the treatment of which he possessed but one qualification—consummate style. In 1874, and again in 1875, Froude visited the South African colonies on a mission from the home government, and published his impressions in *Two Lectures on South Africa* (1880). As Carlyle's literary executor, Froude edited his *Reminiscences* (1881), Mrs Carlyle's *Letters* (3 vols. 1882), and Carlyle's own *Life* (4 vols. 1882–84); and by giving to the world the copious personal criticism and family details contained in these works, he suggested grave doubts as to his editorial discretion. Later works are *Oceana* (1886), a delightful account of an Australasian voyage; *The English in the West Indies* (1888—assailed by West Indians as quite misleading); *The Two Chiefs of Dunboy* (1889), an Irish historical romance; *The Divorce of Catherine of Aragon* (1891); and *The Spanish Story of the Armada, and other Essays* (1892). Minor works were *Calvinism* (1871), *Bunyan* (1880), *Luther* (1883), and *Beaconsfield* (1891). In 1892 he was appointed Professor of Modern History at Oxford, in succession to Freeman, and he died at Salcombe in Devonshire, 20th October 1894. The *Life and Letters of Erasmus* (1894) and *Lectures on the Council of Trent* (1896), both delivered as lectures at Oxford, exhibit his unique merits and his characteristic defects—a power and skill of statement that rank him with the very greatest masters of English prose, a partisan spirit on great issues, and a carelessness about accuracy in details and not unimportant facts. See Skelton's *Table-talk of Shirley* (1895).—His elder brother, RICHARD HURRELL FROUDE, a leader in the Oxford Tractarian movement, was born at Dartington, in Devonshire, 25th March 1803. After graduating at Oxford in 1824 he became Fellow and tutor of Oriel College. Tracts 9 and 63 were from his pen. He died on 28th February 1836. His *Remains* were published three years after his death by Keble and Newman.—Another brother, WILLIAM FROUDE, born in 1810 and educated at Westminster and Oriel College, Oxford, was trained to be a civil engineer, and in 1838 became assistant to Brunel. Retiring from professional work in 1846, he devoted himself, down to his death at the Cape, 4th May 1879, to investigating the laws of naval construction.

Frozen Strait, an Arctic passage, 15 miles wide, separating Southampton Island from Melville Peninsula.

Fructidor ('fruit-month') was the name in the French republican calendar for the period 18th August–16th September (see CALENDAR). On the 18th Fructidor of the year 5 (4th September 1797) there was a *coup d'état* by the Directory.

Fructification, the reproductive system or the 'fruit' of cryptogams. See FUNGI, SEAWEEDS.

Fructose, or FRUIT-SUGAR. See SUGAR.

Frugoni, CARLO INNOCENZO, an Italian poet, was born at Genoa in 1692, and taught rhetoric at Brescia, Genoa, and Bologna, and died in 1768. He belonged to the 'Arcadian' group, and wrote odes, epistles, and satires, and was famous with his contemporaries for versatility and elegance, but is now all but forgotten.

Fruit. In popular language, the term fruit is very vaguely employed. When extended beyond the common limitation of usefulness to man or beast, it tends to be applied to any plant-structure, phanerogamic or cryptogamic, which contains the germ of the new individual—to all the organs of fructification in short. But, as common observation deepens into botany, we find ourselves gradually led to the more precise restriction of the term fruit to the ovary of angiosperms (monocotyledons or dicotyledons) after fertilisation (see FLOWER, OVARY).

The numerous and interesting adaptations of different fruits to the preservation and distribution of the seed will be more conveniently outlined under SEED, while the periodic rhythm between vegetative and reproductive growth to which the question of fruit attracts our attention must be discussed under the more general head of REPRODUCTION. The special structure and physiology of fruits here remain to be considered.

Since the dawn of modern botany, the multifarious forms of fruit have led to many attempts at their classification. Yet the student is more apt to be overwhelmed by the resulting disorderly and redundant nomenclature of the subject than impressed by its systematic clearness. If, however, we keep fast hold of the elementary conceptions of vegetable physiology, morphology, and evolution, the difficulty of enumerating and classifying the various forms of fruit becomes greatly diminished. We must of course assume a knowledge of the general morphology of the Flower (q.v.).

Starting then with those simplest flowers in which all the carpels are separate, we find the stigma and style usually withering back as no longer of service, and the ovary enlarging, as the fertilised ovules grow up into seeds. But in many such simple flowers more ovules are produced than are fertilised, and generally also more fertilised than can be developed up to maturity; hence the reduction of the ovules is exceedingly common. The alternative of reducing the number of carpels also commonly appears: hence in the same order of Ranunculaceæ we have on the one hand the anemone with its multitude of small ovaries which only mature a single ovule, and on the other the larkspur or monkshood with few carpels, but these many-seeded. This process of reduction of the number of carpels or ovules, or of both, has not only taken place in the process of past evolution of the great majority of plants, but is still frequently to be observed in the development of the individual, as is well seen by comparing the characteristically one-celled and one-seeded acorn with a section of the three-celled and six-ovuled ovary from which it actually arose in spring, or, more simply, by recalling to memory the abortive ovules and the corresponding abortion of one or two of the original three divisions of the ovary in the fruit of the horse-chestnut.

A second common-sense 'principle of fruit-making,' as we may call it, is reached through keeping clearly in mind the nature and origin of the ovary; for, however the upgrowth of the axis may in perigynous or epigynous flowers conceal this (see FLOWER), we know the ovary primarily to have arisen from one or more carpellary leaves, of which the individual development has been so greatly checked (doubtless through the precocious development of their sporangia—i.e. ovules), that so far from becoming expanded like all other appendages, they remain closed upon the ovules, and frequently even coalesce with each other from the base upwards, so forming a many-celled ovary, often even with united styles or even stigmas. Yet the tendency to their individual expansion is not lost; in many monstrosities, and normally a few types, such as the common mignonette, the carpellary leaves early begin to expand, so opening the ovary and exposing the seeds long before ripeness. Far more frequently, however, this final development of the

carpellary leaves is delayed until the growth-processes of the seed and fruit have ended, and it is therefore accompanied, or even preceded, by their death; the separation often indicating the lines at once of leaf-margin and leaf-fall.

In the best developed carpellary leaves, such as those of the more floral Ranunculaceæ, we naturally find the ovary 'dehiscing along the ventral suture'—in more simple and less empirical language, the carpellary leaf opening along the line of its united ovule-bearing margins. This is what is termed a *follicle* (fig. 1, *f*).

Since, however, the ovules are on the united margins, the midrib tends to become mechanically unimportant, and to interpose little or no resistance to a tendency to split or tear along its fold, as well as to open along the united margins. Such 'dehiscence by both dorsal and ventral suture' gives us the modification of the follicle known as a *legume* or *pod* (fig. 1, *e*).

A very familiar type, which must not be confused with the pod, is the *siliqua* (or when shortened and broadened the *silicula*) of Cruciferæ. Here the placental edges of two united carpels develop a transverse septum which divides the fruit (fig. 1, *d*); and this is left when the lobes split away, as so familiarly in Honesty.

Among united ovaries which readily split open at the united margins (*septicidal*) we may note that of Gentian (q.v.), while the more familiar three-celled ovary of a violet (fig. 1, *b*) or rock rose with its parietal placentation gives a characteristic example of dehiscence along the midribs of the united carpels, so opening the loculi (*loculicidal*). In the five-celled capsule of the Geranium (q.v.) the carpellary leaves separate not only at the

Fig. 1.

f, follicle; *e*, legume; *d*, silicula; *c*, capsule of henbane; *b*, of violet; *a*, of poppy.

sides but also at the base, so curling inwards and projecting the seed. In Colchicum, white hellebore (Veratrum), and their allies (Melanthaceæ) the dehiscence is characteristically septicidal, the carpels separating instead of the loculi opening: the remaining majority of Liliaceæ are loculicidal. Where, however, the placentæ remain more or less completely upon a central column from which the valves are detached, the dehiscence is said to be *septifragal*.

In henbane (fig. 1, *c*), Anagallis, &c. the dehiscence is circular (*circumscissile*); the possible explanation of this as a disarticulation of the united carpels by their leaf-bases is, however, rendered difficult through the separated portion being a mere lid. Many-celled capsules are numerous in which the leaf-opening or dehiscence is greatly reduced from completeness, witness the *valvular* and *porous* dehiscence of the Lychnis and of the poppy (fig. 1, *a*) respectively. Such cases clearly point us to those of carpels which do not open at all. Such *indehiscent* fruits, produced from carpels so persistently embryonic, are, as we might expect, usually short, few or one-ovuled, and, for the most part, little specialised. Thus the follicle of the Ranunculaceæ of more specialised floral character becomes shortened into the one-seeded indehiscent *achene* of the anemone or buttercup (fig. 2, *e*, *f*). In the achene of the grasses (which similarly represents the capsule of the ancestral lilies) the thin dry pericarp becomes inseparable from the seed-coat (hence the term *caryopsis*, fig. 2, *c*, *d*); in many trees (e.g. hazel) it becomes hardened and thickened as a *nut*. In composites (fig. 2, *a*, *b*), too, the achene is practically a nutlet, although often (on account of its being inferior) termed a

Fig. 2.

e, *f*, achenes of buttercup; *c*, *d*, caryopsis of oat; *a*, *b*, achenes with pappus; *a*, "clomentum"; *i*, *h*, nutlets and ovary of borage; *l*, *k*, umbelliferous type of schizocarp.

cypsela. Less extremely reduced representatives of the various multicellular ovaries to which such fruits correspond are afforded us by borages or labiates, in which the two-celled ovary of the primitive solanaceous type becomes, as in thorn-apple, &c., subsequently divided into four parts: these (see fig. 2, *i*, *h*), however, are here so arrested as only to develop a single ovule in each loculus (of which the subsequent growth brings about the perplexing appearance of the 'gynobasic' style). The four ripe 'nutlets' into which the four-lobed ovary of these forms commonly breaks up were not unnaturally mistaken by the old botanists for naked seeds. In Umbelliferæ we have another characteristic form of *schizocarp*, as all such fruits are termed which split up without truly carpellary dehiscence, although the tendency to this can be seen still to have some influence. Here the separate portions (or *mericarps*), each resembling an achene or nut, are two in number, and when ripe swing off upon the ends of a forked *carpophore* (fig. 2, *l*, *k*).

In exceptional cases we have the pod of some Leguminosæ and the siliqua of some Crucifers—e.g. radish, snapping off into one-seeded joints, instead of dehiscing longitudinally in the regular way. This simply comes about where the swellings corresponding to the seeds become unusually large, leaving narrowings between them, and thus giving the pod a strength of form too great for the usual tension of ripeness to overcome (fig. 2, *g*). To confuse such distinct types of fruit under a common term (*lomentum*), and to separate them from the normally dehiscent capsules to which they really belong, and to place them among the purely 'schizocarpous' fruits we have been describing, although still too customary, are merely examples of the reasoned mistakes inseparable from a purely descriptive anatomy, but from which the evolutionary standpoint is at length delivering us.

So far all our fruits have been dry; but a new physiological 'principle of fruit-making' is necessary to comprehend those in which the pericarp is succulent. For, just as the effect of fertilisation is seen in many animals to extend beyond the mere ovum to the parent organism, and also in many of

the lowest plants, so it is in the case before us. Even in fruits which are dry on ripening we have seen that the ovaries or loculi, on which no demand is made for the growth of fertilised ovules, become reduced or disappear. Sometimes it may be merely the coats of the seed (as in the pomegranate) which undergo the complex histological and chemical changes which we sum up as those of succulence and ripening; at other times largely their placentas, as in the gooseberry and currant. Yet, as in these, the innermost tissue of the ovary may become succulent as well. In the orange also the familiar succulent tissue in which the seeds are immersed are the enlarged succulent cells of the endocarp; the grape too gives a characteristic example of soft endocarp. These may all be classed as berries or baccate fruits, for the distinction of the succulent product of an inferior ovary as a berry, from that of a superior one, as a *nux* or grape, need hardly be allowed to increase our nomenclature. A *pepo* is merely a berry in which the epicarp is thick and tough (e.g. a melon, with which the orange and pomegranate may be reckoned). Where the succulent change, instead of primarily affecting the

Fig. 3.

a, drupe; *b*, orange; *c*, a single drupelet of bramble; *d*, pome; *e*, strawberry; *f*, hip of rose; *g*, capitulum of Dorstenia; *h*, fig.

deeper tissues of the fruit, and so producing a berry, leaves the endocarp hard, we have evidently a well-contrasted type—the drupaceous or stone-fruit. The endocarp here forms a more or less complete 'stone' around the kernel or seed, the difference from an ordinary nut being due to the succulence of an outer layer, as *mesocarp*, with a more or less leathery outer skin, the *epicarp*. The plum, peach, and nectarine are the most obvious examples; but, since we may have many carpels thus transformed, we may have an aggregate fruit or syncarp of tiny drupes. The walnut and even cocoa-nut are hence not true nuts (see NUT). The immature succulent mesocarp of the former is familiar in pickles, the walnut we crack being merely the stony endocarp (which is exceptionally specialised in being set free by the bursting of the mesocarp on ripening). The familiar cocoa-nut fibre is the fibro-vascular tissue of the mesocarp, the fruit being thus broadly comparable to a peach which has wizened while still young and stringy. But, as in the kindred grass, the coats of the ovule further unite to the endocarp.

The numerous carpels of the strawberry, although, of course, corresponding to those of the allied raspberry, remain mere nuts; here, however, the subjacent portion of the floral axis or *receptacle* becomes succulent. In the perigynous or epigynous Rosaceæ the same change may take place; hence the rose-hip is a succulent axis, enclosing a multitude of nuts. The apple or 'pome' is more akin to the drupe, since the carpels, here deeply sunk in the upgrown floral axis, develop a hard endocarp corresponding to the stone of a drupe.

Fertilisation may even be followed by succulent or other thickening of the floral envelopes, or of the floral axis with subjacent bracts—the various *cupules*, as of acorn, beech, hazel-nut, &c., being of this nature. Or we may have a spurious fruit developed at the expense of an entire inflorescence, as in the pine-apple, Dorstenia, and fig. See INFLORESCENCE.

Fruits Important to Man.—The list of the fruits of any importance is much shorter than would at first be supposed, as may be seen from the following enumeration (practically that of Frank), which distinguishes those native or cultivated in northern Europe (Germany and Britain) from the more important foreign fruits, and of course employs the terms stone-fruits, berries, &c. in their merely popular sense.

I. *Indigenous or Cultivated:* (1) *Apples or Pip-fruits.*—Apple (*Pyrus Malus*), Pear (*P. communis*), Medlar (*Mespilus germanica*), Quince (*Cydonia japonica*), Service-berries (*Sorbus torminalis* and *S. domestica*), to which may be added Hips (*Rosa canina*, &c.) and Haws (*Crataegus Oxyacantha*), also Cornel-berries (*Cornus mascula*).

(2) *Stone-fruit.* Peach and Nectarine (*Persica vulgaris*), Apricot (*Prunus armeniaca*), Plum (*P. instititia*), Cherry (*P. Cerasus* and *P. avium*), Damson (*P. domestica*), Greengage (*P. italica*), Sloe (*P. spinosa*), Cherry-plum (*P. cerasifera*), &c.

(3) '*Berries.*'—Grape (*Vitis vinifera*), Strawberry (*Fragaria vesca*, *elatior*, &c.), Raspberry (*Rubus Idaeus*), Bramble or Blackberry (*R. fruticosus*), Gooseberry (*Ribes Grossularia*), Red Currant (*R. rubrum*), Black Currant (*R. nigrum*), Barberry (*Berberis vulgaris*), Black Mulberry (*Morus nigra*), White Mulberry (*M. alba*), Bilberry or Blaeberry (*Vaccinium Myrtillus*) with its minor congeners, Juniper (*Juniperus communis*).

(4) *Nuts or Shell-fruit.* Hazel-nut (*Corylus Avellana*), Filbert (*C. tubulosa*), Walnut (*Juglans regia*). See NUT.

II. *More Important Fruits of Warm, Temperate, and Tropical Regions:* (1) *Stone-fruit.* Date (*Phoenix dactylifera*), Olive (*Olea europaea*), Mango (*Mangifera indica*), Tahiti apple (*Spondias dulcis*), Mombin Plum of West Indies (*S. Mombin*), Avocado Pear (*Persea gratissima*), Icaco or Cocoa Plum (*Chrysobalanus icaco*), Sapota Apple (*Achras Sapota*).

(2) *Berries and Berry-like Fruit* (in widest sense of succulence).—Banana and Plantain (*Musa paradisiaca*), Pine-apple (*Ananassa sativa*), Fig (*Ficus Carica*), Bread-fruit (*Artocarpus incisa* and *integrifolia*), Custard Apple (*Anona squamosa*, &c.), Baobab (*Adansonia digitata*), Orange, Lemon, Lime, Citron, Shaddock, Pompelmoose, Forbidden Fruit, Bergamot, and other species of *Citrus*, Pomegranate (*Punica granatum*), Guava (*Psidium piriferum*), Rose-apple of East Indies (*Jambosa domestica* and *vulgaris*), Tamarind (*Tamarindus indica*), Carob or Locust Bean (*Ceratonia siliqua*), Papaw (*Carica Papaya*), Pumpkin (*Cucurbita Pepo*, &c.), Melon (*Cucumis Melo*), Water-melon (*C. Citrullus*), Cucumber (*C. sativus*), Tomato (*Lycopersicum esculentum*), Lotus (*Diospyros lotus*), Jujube (*Zizyphus vulgaris*), Mangosteen (*Garcinia Mangostana*), Prickly Pear (*Opuntia vulgaris*).

(3) *Nuts or Shell-fruit.*—Cocoa-nut (*Cocos nucifera*), Almond (*Amygdalus communis*), Chestnut (*Castanea vesca*), Litchi or Lee-chee (*Nephelium Litchi*) (really, however, a shelled drupe), Brazil-nut (*Bertholletia excelsa*), &c.

Chemical Composition of Fruits.—Our knowledge of the chemistry of fruit may be dated from the analyses of Fresenius (1857). But because of the innumerable varieties of almost every cultivated fruit, the effects of different soils and climates

upon these, and still more of the fluctuation due to better or worse seasons, the results of any one chemical analysis would tend to convey an idea of undue precision. Thus—e.g. while the ratio of sugar to free acid in certain grapes of an ordinary wine-year was found to be 16 to 1, in a very bad year it sank to 12, and in a very good year rose to 24. Hence a broad outline may be of more general use than the statistics of any one analysis.

The percentage of water may be taken as varying from 78 to 80 in the grape and cherry, as from 82 to 85 in plums, peaches, apples, and pears, as 82 to 87 in brambles, currants, &c., and as much as 95 in the water-melon. The proportion of insoluble residue—skin and cellulose, stone and seed—obviously also varies greatly with succulence and ripeness, but may be taken, one fruit with another, at not less than from 4 to 6 per cent. Unripe fruits may contain a notable proportion of starch, but this is fermented on ripening into glucose and other sugars, fruit-sugar, grape-sugar, cane-sugar, or (in *Sorbus*) sorbin. The only fruits which retain starch in important quantity are those of the banana, bread-fruit tree, and baobab; hence the exceptional nutritive value of these. The olive alone yields a notable proportion of oil. The proportion of sugars varies exceedingly, dates, dry figs (48 per cent.), and raisins (56 per cent.), again very important foods, heading the list. Grapes of course stand high, from 12 to 18, indeed sometimes as much as 26 per cent., cherries from 8 to 13, apples 6 to 8, pears 7 to 8, plums 6, red currants 4·75, greengage 3·5, peach and apricot only 1·5. The proportion of pectin bodies is, however, exceedingly notable, especially in fruits such as the three last named. In unripe fruits (as also in roots) we find *pectose*, a body apparently related to cellulose, but easily transmuted by a natural ferment or by boiling with dilute acid into pectin, $C_4H_6O_4$, and its allies. These are all more or less soluble in water, with which they readily form a jelly (whence the peculiar consistency of our fruit-preserves). The proportion of soluble pectin and gum varies considerably and is of great importance to the blandness and agreeableness of fruit, the harder and more common apples having considerably less than 3 per cent. and the best rennets nearly 8. The harsh red currant, indeed, like berries in general, has exceedingly little (0·25 per cent.); while the apricot has as much as 9, the greengage 12, and the peach 16—a circumstance which explains the peculiarly melting quality of these fruits, especially the last named. The free acid also varies greatly, from 2·4 per cent. in the red currant, 1·4 in the raspberry, and nearly as much in the sourest cherries, to 0·5 in sweet cherries and a minimum of 0·1 or less in the sweetest pears. That of apples and of grapes, of course, varies greatly, but both may generally be taken at from 1 to 0·75, while the apricot and peach stand at 0·3 or 0·4. The acid is primarily malic, but citric, acetic, oxalic, tannic, and others may also be present.

The quantity of albuminoids is of course small, in fact inadequate to render most fruits a staple food. Yet it is by no means inappreciable, ranging from nearly ·5 per cent. in the majority of fruits to ·7 or ·8 in the grape (2·7 in raisins), and above 1 in the melon and tomato. Hence to acquire albuminoids equal to those of one egg we must eat 1½ lb. of grapes, 2 lb. strawberries, 2½ lb. apples, or 4 lb. pears. To replace 1 lb. starch = 5½ lb. potatoes, we need 5·4 lb. grapes, 6·7 of cherries or apples, or 12·3 of strawberries (see FOOD).

The quality of fruits depends largely upon the proportion of sugar, gum, and pectin to free acid, largely also upon the proportion of soluble to insoluble matters, but in very great measure also upon the aroma. This quality is due to the presence of characteristic ethers, often accompanied by essential oils, although not of course in ponderable percentage. Cultivation and selection operate strongly on all three factors.

Keeping of Fruit.—Many of the finest fruits undergo very speedy decomposition, which, as distinguished from the intrinsic processes of ripening, is due to the attacks of bacteria, moulds, or yeasts; and the problem of their preservation is therefore primarily one of preventing these. In damp and stagnant air, especially with considerable or frequent changes of temperature, these fungus pests multiply with special readiness; hence a fruit-room must be cool and shady, yet dry and airy, and the fruit carefully gathered rather before full ripeness, handled so as to avoid in any way bruising or tearing the skin, and laid out and occasionally looked over so that rottenness in one may not affect the rest. Under these conditions apples especially may be kept for many months; indeed many varieties of fruit—e.g. winter-pears—require these conditions for satisfactory ripening. On antiseptic principles we see how it is that the dense-skinned and wax-coated grape can be so largely imported in sawdust, or how unripe gooseberries, and even very perishable pears can be kept for months similarly packed in well-sealed jars in a cool place. The process of preserving with sugar in jars promptly covered up is similarly an antiseptic one; but in the systematic application of antiseptic principles we may still look for considerable progress in the preservation and transport of fresh fruit upon a large scale. The method of drying fruit has also been in use from remote times, especially with dates, figs, and raisins.

Of late years more attention has been bestowed on fruit-growing in Britain, and a large area of land is devoted to fruit-culture. But difficulties in distribution and the cost of transport have not infrequently the effect of glutting the available markets in good years, and making prices wholly unremunerative. By far the most of the fruit grown in Britain is produced in the counties nearest London. On the other hand, the reduction in the cost of ocean transit has largely increased our imports of fresh as well as dried fruit, all of which are free of duty, save figs, fig-cake, plums preserved otherwise than in sugar, prunes, and raisins (on which the duty is 7s. per cwt.), and currants (at 2s. per cwt.). The annual imports of fresh oranges and lemons have a value of over £2,000,000 per annum; of currants and raisins, £1,600,000; and of other fruit, over £2,000,000.

In the United States, the extension of the fruit-growing area has been very great; orange-growing in Florida and some other southern states is now a great industry; and in California (besides wine-producing), the preparation of rearing and growing of oranges, figs, and other fruits is carried on on a large scale. Then the United States imports annually—largely from the West Indies—fruits and nuts (especially bananas and cocoa-nuts) to the value of $17,000,000 a year, while exporting fruits and nuts to the value of $5,000,000. Fruit is cultivated in the Himalayas for Anglo-Indian use, and apples grow magnificently there.

See GARDENING, ORCHARD; the articles on APPLES, PEARS, PEACHES, and the various fruits; WINE, CIDER, &c.; PRESERVED PROVISIONS; and works on fruit-culture by Cheal (new ed. 1892), Thomson (1881), Fish (1882), Burbidge (1881), Du Breuil (1886), Hogg (1885), Wood (1880); and for America, by Downing (1876), Fuller (1881), Roe (1886), and Thomas (1876).

Fruit-pigeon (*Carpophaga*), a genus of pigeons, including about fifty species, distributed over the whole Australian and Oriental regions,

but much more abundant in the former. They live in forests, are well adapted for arboreal life, and feed on fruits. The gape is wide; the colouring of the plumage brilliant. The term fruit-pigeon is also extended to members of other genera—Treron, Alectrœnas, &c. See PIGEON.

Fruit-pigeon (*Carpophaga aenea*).

Frumentius, ST., apostle of Ethiopia and the Abyssinians, born in Phœnicia towards the beginning of the 4th century. At a very early age he and another youth, named Ædesius, accompanied their uncle Meropius on a voyage undertaken for mercantile purposes, and they landed on the coast of Abyssinia or Ethiopia to procure fresh water; but the savage inhabitants made an onslaught upon them, and murdered Meropius and the whole crew, sparing only the two boys. They were taken as slaves into the service of the king, and made themselves so beloved that Ædesius was soon raised to the office of cupbearer, while Frumentius became the king's private secretary and instructor to the young prince, obtaining great influence in the administration of the state affairs. He aided the Christian merchants who sought these parts in founding a church, and gradually paved the way for the formal introduction of the new creed. In 326 he went to Alexandria, and was by Athanasius consecrated Bishop of Axum. The new bishop repaired to Abyssinia, and succeeded in proselytising large numbers. He is also supposed to have translated the Bible into Ethiopian (see ETHIOPIA). Frumentius died about 360.

Frumenty, or FURMETY (Lat. *frumentum*, 'wheat'), an English dish made of whole wheat or rice boiled in milk and seasoned.

Frundsberg, GEORG VON, the great leader of the German landsknechte during the Italian wars of the emperors Maximilian and Charles V., was born in 1473 at Mindelheim in Swabia, and there he died in 1528. He fought in twenty pitched battles, besides sieges and skirmishes without number; and the victory of Pavia (1525) was largely due to him. Two years later he was marching on Rome with the Constable de Bourbon, when a mutiny of his soldiers brought on a stroke of apoplexy. See monographs by Barthold (1833) and Heilmann (1868).

Frustum, in Geometry, is the part of a solid next the base, left on cutting off the top by a plane parallel to the base. The frustum of a sphere or spheroid, however, is any part of these solids comprised between two circular sections; and the *middle* frustum of a sphere is that whose ends are equal circles, having the centre of the sphere in the middle of it, and equally distant from both ends.

Fry, ELIZABETH, born May 21, 1780, was the third daughter of John Gurney, Esq., of Earlham Hall, near Norwich, a rich banker, and a member of the Society of Friends. Her mother died when she was twelve years old, leaving four sons and seven daughters. The sisters grew up attractive and original. They dressed gaily, and sang and danced. Till Elizabeth was eighteen she had no decided religious opinions. In February 1798 a discourse she heard in the Friends' meeting house at Norwich by William Savery, an American Friend, made a deep impression on her, and led her to wish to become a 'plain Friend.' From this time her natural loving care for others was greater than before. She worked much among the poor, and began a school for poor children, which she managed entirely herself, even when the number of scholars increased to more than seventy. In August 1800 she married Joseph Fry, of Plashet, Essex, then engaged in extensive business with his brother in London. She lived with her husband in his house of business, St Mildred's Court, City of London, till 1809, when, on the death of her father-in-law, she removed to Plashet. Five children were born to her in London, and six more at Plashet. In 1810 she became a preacher among the Friends. In February 1813 she visited Newgate for the first time, and saw 300 women, tried and untried, with their numerous children, without employment, in an almost lawless state, crowded together in rags and dirt, with no bedding, and nothing but the floor to sleep on. She could do no more then than supply them with clothes, but, within a few years, by her efforts, a school and a manufactory were established in the prison, a Ladies' Association was formed for 'the improvement of the female prisoners,' religious instruction was regularly given to them, a matron was appointed, and the women willingly submitted to rules for their well-being. Prison reform now became one great object of Mrs Fry's life. She visited prisons in different parts of the kingdom and on the Continent, and introduced many improvements in their management and discipline. She also did a great deal to improve the condition of the female convicts sentenced to transportation. Through her influence libraries were begun in the naval hospitals and the coastguard stations, and Bibles were supplied to them. She died at Ramsgate, October 12, 1845, and was buried at Barking, Essex. Mrs Fry was a true-hearted, loving woman, peculiarly gifted for the difficult work she had to do by her sympathy, swift insight, tact, and charm of manner. See the Life by her daughters (2 vols. 1847); that by Mrs Pitman (1884); and Hare's *Gurneys of Earlham* (1895).

Frying. See BOILING, COOKERY, FOOD.

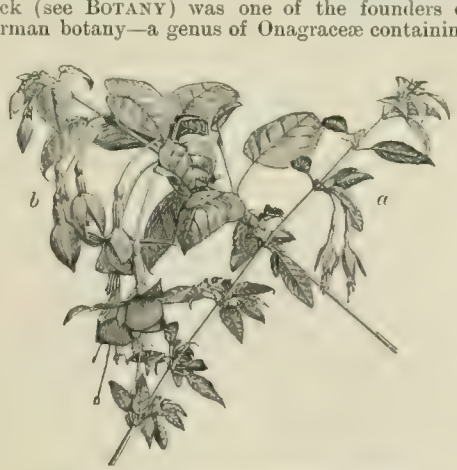
Fryxell, ANDERS, a Swedish historian, was born 7th February 1795, at Hesselskog in Dalsland; studied at Upsala, took priest's orders in 1820, and in 1828 became rector of a gymnasium in Stockholm. From 1835 to 1847 he was parish priest of Sunna in Vermland, and from this latter year he devoted himself entirely to literary pursuits till his death at Stockholm, 21st March 1881. His reputation rests upon *Berättelser ur Svenska Historien* ('Narratives from Swedish History,' 46 vols. Stockh. 1832–80). These narratives, largely biographical in form, and distinguished by their impartial love of truth, soon obtained a wide popularity in Sweden. Parts of them have been translated into almost all European languages (Eng. trans. edited by Mary Howitt, 1844). Another work, *Conspiracies of the Swedish Aristocracy* (4 vols. Upsala, 1845–50), was intended as a reply to the accusations urged against that class by Geijer and others, and involved Fryxell in a keen controversy with the democratic liberal party in Sweden. Besides these works he wrote a *Contribution to the History of the Literature of Sweden* (9 vols. 1860–62). Fryxell also laboured, both by his own example and by the publication of a *Swedish Grammar*, to purify his native language from the parasitism of foreign words.

Fuad Pasha, MEHMED, a Turkish statesman and littérateur, was born at Constantinople, 17th January 1814. He was the son of the celebrated poet, Izzet-Mollah, and had already begun to make himself known as an author, when the exile of his father, who had fallen into disgrace with the Sultan Mahmud, compelled him to choose a profession. He studied medicine, and for some years was Admiralty physician, but in 1835 abruptly forsook medicine, and employed himself in the study of diplomacy, history, modern languages, the rights of nations, and political economy. In 1840 he became first secretary to the Turkish embassy at London, and in 1843 was at Madrid. It was almost impossible to believe him to be a Turk, he spoke French so marvellously well. On his return to Constantinople he was appointed to discharge the functions of grand interpreter to the Porte, and in 1852 became minister of foreign affairs. On the question of the 'Holy Places,' Fuad Pasha, by his attitude, and by a brochure very hostile to the pretensions of Russia, gave great dissatisfaction to the czar. In 1855 he received the title of Pasha, and was again appointed minister of foreign affairs. From 1861 to 1866 he held the office of Grand Vizier. He died in 1869. To him especially it is said Turkey owes the hatti-sherif of 1856. See TURKEY.

Fuca, or JUAN DE FUCA, STRAIT, a passage separating Washington State from Vancouver Island, and connecting the Pacific Ocean with the Gulf of Georgia. It contains several islands, one of which, San Juan, became the subject of a dispute between Great Britain and the United States, the question being whether it was to be regarded as an appendage of Washington Territory or of British Columbia. In 1872 the emperor of Germany, as arbiter, decided that the line of boundary should be run through the Strait of Haro, west of San Juan, thus awarding that island to the United States; and it and several neighbouring islands now form a county of Washington State, with a population of 948.

Fû-chau. See FOOCHOW.

Fuchsia—named in 1703 by Plumier after Leonhard Fuchs (1501–66), who with Brunfels and Bock (see BOTANY) was one of the founders of German botany—a genus of Onagraceæ containing



a, Fuchsia Riccartoni; *b*, a garden variety.

about fifty species, small shrubs or trees, natives of the Pacific coast of South America, whence a few have ranged northwards to Central America, and others to New Zealand. The usually pendulous flowers are of characteristic appearance and often striking beauty; they are very easily propagated by cuttings and grow freely, especially near the seacoast. Some, notably *F. discolor* and *F. Riccartoni*, are capable of withstanding our winter so well that fuchsia-hedges are a common ornament of gardens on the west coast of Scotland. Others can be treated as herbaceous plants; and most if not indeed all will flower well in the open air during summer. Cultivators recommend keeping back plants, so that when planted out in May they shall only then begin to put out their leaves. The commonest species is usually known as *F. coccinea* (but is said to be only a variety of *F. globosa*, and this again of *F. macrostemma*, while the true *F. coccinea*, with nearly sessile leaves, is rare); *F. conica*, *coralliua*, *fulgens*, *gracilis*, &c. are also well known, as well as the hardier species above named, while the florists' varieties and hybrids are innumerable. There are also many dwarf species of characteristic habits. The berries of many species are eaten with sugar in their native countries, and when they ripen are occasionally preserved even here. The wood of some species is also employed in South America as a black dye.

Fuchsine. See DYEING.

Fuchs's Soluble Glass. See GLASS, p. 245.

Fucino, LAKE OF, or LAGO DI CELANO (ancient *Fucinus Lacus*), a lake of Italy, in the province of Aquila, with an area of 61 sq. m., is situated 2172 feet above sea-level. Being only 75 feet deep and having no constant outflow, it was subject to sudden risings, which on more than one occasion inundated the surrounding regions. To obviate this danger the Emperor Claudius cut a subterranean channel, nearly 3 miles in length, through the solid rock of Monte Salviano, 30,000 men being engaged in the work from 44 to 54 A.D. This tunnel, however, soon became obstructed and long remained so, notwithstanding various attempts to clear it. As the lake had been steadily rising from 1783, a new canal was made (1852–62) by the Swiss engineer De Montricher. By 1875 the lake was dry; it is now under cultivation.

Fucus, the generic name of the various species of brown sea-wrack which form the main vegetation of rocky shores between tide-marks. Commonest of all upon European coasts (save in the Mediterranean), and abundant also in the North Pacific, is *F. vesiculosus* (Bladderweed, Black Tang, Seaware, Kelp-ware, &c.), easily distinguished by its entire edges and paired air-vesicles. In scarcity of better fodder, oxen, sheep, and deer will eat it from the rocks, and in North Europe it is sometimes boiled for hogs with a little coarse flour. On account of the very large proportion of ash (up to 23 per cent. of the dry weight), it forms a valuable manure, and, although very imperfectly utilised in most places, is regularly harvested as 'varec' or 'vraic' by the farmers of the Channel Isles and their kinsmen of the adjacent mainland. The chemical composition also made it the staple of the industry of kelp-burning (see KELP), once so important as a source of raw material to the soap-boiler and glass-maker. Even more esteemed for these purposes, although unfortunately abounding nearer low-water mark, was the kindred *F. nodosus* (Knobbed Wrack) with its solitary air-vesicles in the line of the absent midrib. *F. serratus* (Black Wrack), also very common and easily recognised by its serrated fronds without air-vesicles, was least valued. With these are gathered other less common species, as well as the Laminaria (see SEAWEEDS), exposed by the lowest tides. Besides manure, the only direct chemical utilisation of the Fuci is for the preparation of iodine; and the important proportion of iodine present justifies their ancient medicinal repute in the treatment of scrofulous diseases, the

Quercus marina of ancient pharmacy being *F. serratus*, and the *Æthiops vegetabilis* the charred residue of this and its allies. An alcoholic extract is also frequently advertised for the treatment of corpulence.

The genus Fucus and a few closely allied genera (e.g. Fucodium, Himanthalia, Cystoseira, and notably Sargassum, specially described under GULF WEED), form the family Fucaceæ, which are the highest, and with the allied Laminariaceæ, also the most familiar representatives of the large alliance of brown seaweeds (see the article SEAWEEDS). The vegetative body is usually a thallus, yet in Sargassum, &c., a distinction of this into stem and leaves is very complete. The branching of Fucus is dichotomous in one plane. Of the inner or medullary cells of the thallus, the outer wall becomes mucilaginous, while the less superficial of the rind cells develop filaments which grow inwards, so surrounding the inner cells within a network of filaments. The bladders are formed by the simple separation of portions of the tissue, the cavities becoming distended by air. A sexual multiplication may be said to be absent, but sexual reproduction is easily observed. A large area at the end of the frond becomes covered with small depressions, which are overgrown until they are spherical flasks with only a minute opening on the surface. The cells lining this flask or *conceptacle* proceed to divide, and many form barren cellular filaments which, however, instead of turning inwards, as in vegetative growth, grow into the cavity of the flask or even project beyond it as a tuft of hairs. But many are arrested in division while still only two-celled, and the upper of these cells enlarges greatly. In some forms (Cystoseira, Himanthalia) this becomes the ovum, but in others its contents divide into two, four, or in Fucus eight ova; hence it is termed the oogonium. Other filaments again not only lengthen, but branch freely. Their terminal cells become antheridia—i.e. their protoplasm divides into a multitude of spermatozoids. Fertilisation takes place when the ripe fertile fronds are left bare by the tide, the change of specific gravity through evaporation doubtless being of importance in aiding the escape of the sexual products. The outer membrane of the oogonium, like that of a medullary cell, becomes mucilaginous and gives way, and the groups of eight ova, still, however, enclosed within the inner wall, escape from the conceptacle; the antheridia, too, break off and escape to the opening of the conceptacle (perhaps helped by the slight contraction of the volume of this which evaporation must tend to produce). When the tide returns, both ova and spermatozoids break completely free and fertilisation takes place. Cross-fertilisation, always possible even where, as in *F. platycarpus*, the same conceptacle develops ova and spermatozoa, becomes perfect in the more familiar species, of which the greater prevalence thus becomes more intelligible. The fertilised ovum soon develops a wall, becomes attached, and proceeds to divide and lengthen, soon forming a root-like attachment at one end, a growing point at the other. See SEAWEEDS; also special articles above mentioned.

Fuego, TIERRA DEL. See TIERRA DEL FUEGO.

Fuel. The chief mode of artificially producing that condition of matter which is called heat is by burning certain substances in air. These substances contain carbon and hydrogen, which during the chemical change implied by burning unite with the atmospheric oxygen, and as the temperature rises emit light as well as heat. Since these two elements are very widely distributed in nature, the classification of all the compounds which may be termed fuels is somewhat difficult. After using wood for long ages men at last laid the mineral kingdom under requisition, but the fuels thence derived were soon recognised to be undoubtedly of vegetable origin. Some writers include all these under the term natural, and distinguish such derivatives as coke, charcoal, and combustible gases as artificial. Popularly, fuels are a large class of compounds, all of vegetable origin except the animal oils and fats, which produce heat and light when raised to 'kindling temperature.' Thus, besides coal and coke, wood and charcoal, and peat or turf, we must reckon tallow, wax, alcohol, coal and other gases, petroleum, creasote or 'dead-oil,' and others as fuels. To be exhaustive, we should further refer to a sub-class called 'patent' fuels.

The ordinary solid fuels fall under two heads: those containing water in a large proportion—e.g. wood, turf, and most coals—and therefore producing, when burned, hydrogen as well as carbon; and secondly, those which are purely carbonaceous—coke, charcoal, and anthracite. In recent times, since metallurgy has assumed such proportions in all countries, and especially since the application of steam-power, the coking of coal has been more and more perfected, in order to concentrate the carbon and present a fuel capable of producing a higher temperature. Wood as a fuel is either light and soft, as deal, or heavy and hard, as oak; but neither kind is now applied in metal-working, unless in the concentrated form of charcoal. Wood contains so large a proportion of water as to reduce its heat-giving quality both in quantity and intensity, and contains less than half its weight of carbon (see table).

Charcoal is formed by condensing the carbon of wood and expelling the hydrogen and oxygen, just as coke is a concentration of coal by an analogous process. When the wood has been packed and so closed in as to prevent access of air, by raising the whole to a temperature of about 300°, the watery and gaseous particles are entirely expelled, and a mass of almost pure carbon remains. Similarly from coal we have coke, prepared by 'dry distillation' or imperfect combustion, so as to retain the carbonaceous part in a concentrated state and set free the volatile ingredients and part of the sulphur. A special property of coke for metallurgy, as compared with coal, is that, when exposed to high temperatures as in iron-blast furnaces, it does not become pasty.

Turf or peat is an agglomeration of decayed vegetable matter, such as is frequently found on the sites of ancient forests. It is remarked that no instance of its formation occurs within the tropics; though Lyell describes the Great Dismal Swamp between Virginia and North Carolina to be a mass of black peat-like matter, 15 feet deep. Some peaty sediment has also been noted in a Cashmere lake. From holding so small a percentage of carbon, turf is of little use in the arts; but in Bavaria it has been utilised for locomotive engines after being compressed into bricks, and in some districts it has been converted into a species of charcoal.

Superior to the peat fuels, though still inferior in carbon to coal proper, are the lignites or brown coal, which occur in geological deposits of more recent formation than the true coal-measures. The lignites contain a larger proportion of water than coals properly so termed; and are of so many varieties as gradually to pass into the bituminous class, which are known by their smoky flame and derive their name, not from any bitumen in their composition, but from the well-known tars which they produce. With the bituminous must be reckoned the 'coking coal' and the 'cannel (i.e.

candle) coal.' The last-mentioned variety, moreover, includes the Edinburgh 'parrot coal' (so named from its crackling) and the 'horn coal' of South Wales, which is characterised by a smell like that of burnt horn. At the head of this class of fuels is the anthracite coal, holding over 90 per cent. of carbon, and therefore of special value for some purposes in metallurgy and otherwise. Anthracite is very compact, somewhat brittle, and does not stain the fingers like ordinary coal.

For comparing as fuels some leading types of coals the following table—which is an abstract from various returns—will be of use, presenting the percentage of carbon, of hydrogen, and the ash left after combustion :

Fuel.	Carbon.	Hydrogen.	Ash.
Welsh coal	91·3	3·3	1·6
Mayenne	90·7	3·9	·9
Pennsylvania	89·2	2·4	4·7
Newcastle	86·8	5·2	1·4
Glasgow	83·0	3·3	6·1
Lancashire	82·6	5·7	2·6
Fifeshire	81·2	3·8	4·5
Blanzy	75·4	5·2	2·3
Ayrshire	73·4	2·9	5·0
Lignites (E. France)	69·1	5·2	3·0
Asphaltum (Mexico)	78·1	9·3	2·8
Peats (France)	57·2	5·9	5·0
Wood (average)	45-49·6	5·8	2·0

In primitive times the scarcity of wood in some parts of Egypt and India suggested the use as fuel of sun-dried cakes of the dung of camels and oxen. A similar practice exists to-day in the trackless steppes of Central Asia; and so, too, in various countries of Europe much refuse, especially of a vegetable nature, is utilised which in coal or wood producing districts is rejected as absolutely worthless. In eastern France, for example, and Germany all the spent bark from tanneries is formed into cakes for fuel, and estimated as worth about three-fourths the same weight of wood. Where coal is not found or cannot profitably be conveyed, the preservation of forests is of manifest importance; and in certain parts of Europe, for example, trees are systematically planted in hedgerows and otherwise to provide fuel. For the same reason pollarding is resorted to, the branches being regularly cut, and the trunk left to grow fresh fuel. The scientific world, with as good a reason as the primitive races, have recently found means to largely supplement the natural supply of vegetable and mineral fuels by fluid or gaseous substances. Thus, in smelting iron, for example, the carbonic oxide, which formerly was carried off in the smoke from the blast-furnace, is now sometimes collected and conveyed in pipes to be utilised as fuel under steam-boilers. Natural gas has also been used to good purpose, notably in Pennsylvania, United States, where in several instances it has been transferred for several miles for heating furnaces. In the same district petroleum is a recognised liquid fuel, as well as naphtha, its derivative. Another liquid fuel is creasote-oil, derived from coal-tar, which is reported to possess, weight for weight, at least twice the power of coal for raising steam. The United States chemists and metallurgists are agreed that not only is a 'higher, steadier, and more even heat' produced by liquid fuel, but that, for heating iron more especially, a smaller quantity and shorter time suffice to obtain the same results. Baku petroleum is used as fuel for locomotives and steamers in South-east Russia. See GAS.

Under this head we subjoin some figures from a report of a Royal Commission drawn up in 1871 by Professor Rankine. The first column (A) shows the quantity of heat units generated by the fuel; the second (B) the pounds of water heated from 60° to 212°, and then, of course, converted into steam; and the third column (C) gives the comparative temperature of the fire or flame :

Fuel.	A.	B.	C.
Petroleum	20,000	15	4646
Paraffin-oil	20,000	15	4646
Oil from coal	20,000	15	4646
Creasote	16,626	13	4495
Coal	from 13,890 to 14,833	8·95 to 9·67	2500 to 2500

The three points noted in testing a fuel chemically are the intensity of the heat, the quantity of heat developed in combustion, and the luminosity. The last of these, however, affords but an imperfect measure of the temperature, because it is mainly due to the presence of solid particles. Instead of the second some writers use the term 'calorific power.' In ordinary coal combustion there are two steps of the process: (1) the carbon is separated from the hydrogen in light particles, which, unless burned, appear as soot or smoke; (2) the hydrogen becoming ignited heats up the carbon particles, which therefore appear as flame. For the complete combustion, therefore, of a typical hydrocarbon we require not only air in sufficient quantity, but also intensity of heat above the fuel. In a good furnace the supply of coal should by mechanical contrivance be rendered as regular and uniform as that of air; and the body of the furnace should be so protected from the boiler surface and other cooling agents as to steadily maintain a temperature sufficient for thorough ignition of the flame.

What are called 'patent fuels' arise mainly from the desire to utilise the refuse arising from the production or wasteful use of coal. Such artificial fuel, however, is by no means an entirely modern device, since the Chinese have for ages been accustomed to mix coal-dust with clay and bitumen, so much so as to constitute a large branch of industry. The most common form of 'patent fuel' is a mixture of the small coal which accumulates at the pit mouths with sand, marl, or clay, or of some bituminous or resinous substance with sawdust. A second kind has dried and compressed peat as its basis, and is sold in the form of a dense brown solid. Another is an attempt to utilise small coke and the refuse 'breeze,' which is well known in charcoal burning. The 'charbon de Paris' is a combination of the dust of anthracite charcoal and similar refuse with coal-tar, so as to form a paste and be moulded into small cylinders of about 4 inches in length. Briquettes (q.v.) are compounds of waste coal-dust and pitch.

See Report of Royal Commission on the Coal of the United Kingdom (1871); Report on the Coals suited to the Steam Navy (1848); Rumford's Works, vols. ii., iii.; Williams, *Fuel: its Combustion and Economy* (3d ed. 1886); Phillips, *Fuels: their Analysis and Valuation* (1890).

Fuente Alamo, a town of Spain, 20 miles S. of Murcia. Pop. 7900.

Fuente Ovejuna, a small walled town of Spain, 45 miles NW. of Cordova. Pop. 7937.

Fuenterrabia. See FONTARABIA.

Fuentes de Oñoro, a small village of Salamanca, Spain, on the Portuguese frontier, 15 miles WSW. of Ciudad Rodrigo, was the scene of an important battle of the Peninsular war on the 5th May 1811, when Wellington defeated Massena. The English lost 2000, the French 5000.

Fuero (Span.; Portuguese, *foral, foraes;* Galician, *foro;* Gascoun, *fors;* Lat. *forum*), a term used in different senses. (1) The title of a law code, *Fuero Juzgo*, the so-called legislation of the Gothic kings of Spain; *Fuero Real*, &c. (2) The municipal charters of privileges granted by kings, lords, and monastic bodies to inhabitants of towns—Leon (1020), Najera (1035), Sahagun (1085), &c., especially to towns deserted or recaptured from the Moors, or those used for frontier defence—e.g. Oloron, in Béarn (1080). Sometimes these charters were offered especially to foreigners, *Fueros Francos.*

Charters granted to attract settlers and those given by the royal power must be distinguished from others; fueros based on legislation long antecedent and flourishing, e.g. those of Lerida (1228), were compiled 'de statutis scriptis et non scriptis, et moribus et usaticis, etiam legibus Goticis et Romanis.' The term is also applied to the capitulations granted to Moors and Jews, the oldest of which is that of Huesca (1089). (3) Modes and tenures of property, succession, &c., nearly equivalent to the French *coutumes*, *usages*, or customary law—e.g. *El Fuero de Galicia*, *Los Fors et Costumps de Bearn*, &c. The date of the writing down of this class of fueros is no measure at all of their real antiquity. (4) The whole body of legislation and the constitution of certain practically autonomous states and communities in northern Spain and south-western France—e.g. the fueros of the provincias Vascongadas, Biscay, Alava, and Guipuzcoa; in a slightly less degree of autonomy, the fueros of Navarre; and of a still less, those of Aragon, of Bearn, &c.

Groups 1 and 2 we may pass over to be studied in the documents special to each case. Group 3 is of far greater importance. In it we find traces of customs and tenures which have long disappeared from other codes, and the origin of which belongs to the tribal or pastoral condition of society. There are also anomalies not to be fully explained by our present knowledge, as the *derecho consuetudinario* of Upper Aragon, identical with the *house community* of the southern Slavs, though there is no apparent racial or other connection with the Slavs. In the chief region of these fueros, from the borders of Catalonia to Santander, there is no trace in the foral legislation of Gothic or Teutonic influence. Within the states of class 4, and outside them in the same region, were various kinds of autonomies, or local self-governments, municipalities, federations of towns, valleys, districts, communes, each with its own special fuero. The term *republicas, republiques* was often applied to these communities in transactions between themselves, as also by the kings of Spain in the Cortes of Navarre, to the Basque provinces, and to the separate valleys and communes down to the French Revolution.

The chief provision of the fueros, whereby these communities preserved their autonomy, was a freely elected legislative body, chosen according to the methods customary in each district, meeting at a given place at given times. This assembly was called the *junta* in the separate Basque provinces, with the Junta General meeting at the oak of Guernica in Biscay, Cortes in Navarre, Etats in Bearn, Bilzaar in the Labourd, Cort, Tilhabet, &c., in the lesser communities. In these assemblies the right of taxation was jealously guarded. The contribution to the king was the last vote taken, after all grievances had been redressed and petitions heard, and then only as a voluntary gift. The repartition of taxes to individuals was in the hands of each separate community. Freedom of commerce existed, with few or no customs-duties. The levy and command of the military forces of the states remained in their own power; the number of soldiers was fixed, with no compulsion to serve beyond the confines of the province, unless with consent of the juntas, &c., and for payment guaranteed. This did not prevent voluntary service of individuals. Jurisdiction of all kinds was in their own power. In all matters relating to property, land-tenure, inheritance, &c., even in particular families, the local customs or fueros overrode both the general fueros and the general laws either of Spain or of France; only the nobles or Infanzones were subject to these. Under this constitution the Basque provinces flourished, and supported the largest population per square mile in Spain, with the exception of Galicia, until the middle of the present century. On the death of Ferdinand VII. (1833), the liberal regency hesitated to confirm the fueros. Don Carlos, the late king's brother, raised the standard of revolt. The seven years' war was ended by the Convention of Vergara, 30th August 1839, and Isabella confirmed the fueros. Don Carlos, grandson of the first, headed the second Carlist war (1872–76). It resulted in the loss of the fueros of the provinces, which will gradually become assimilated to the rest of Spain. In France, save for the management of the communal property in some parishes, the *fors* were swept away by the Revolution and the Code Napoleon, though some traces still remain in the habits and customs of the people.

See the article Basques, and the following special books: Marichalar y Manrique, *Historia de la Legislacion y Recitas de España* (vol. ii. 2d ed. Madrid, 1868); Muñoz y Rivero, *Coleccion de Fueros Municipales* (Madrid, 1847); *Catalogo de Fueros y Cartas Pueblas de España* (R. Academia de Historia, Madrid, 1852); Mazure et Hatoulet, *Fors de Béarn* (Pau, 1842); G. B. de Lagrèze, *La Navarre Française* (Paris, 1881); the last editions of the separate *Fueros* published in each province at Zaragoza, Pamplona, Tolosa, Bilbao.

Fugger, a remarkable Swabian family, which rising by industry and commerce founded lines of counts and even princes. The ancestor of the family was John Fugger, master-weaver, born in 1348 at Graben, near Augsburg. His eldest son, John Fugger, acquired by marriage, in 1370, the freedom of Augsburg; he died in 1409. But the real founder of the house was John's second son, Jacob Fugger, who died in 1469, and was the first of the Fuggers that had a house in Augsburg, and carried on an already extensive commerce. Of his seven sons, three, Ulrich, George, and Jacob II., by means of industry, ability, and integrity, extended their business to an extraordinary degree, and laid the foundation for the palmy days of the family. They married into the noblest houses, and were raised by the Emperor Maximilian to the rank of nobles. The emperor mortgaged to them, for 10,000 gold guldens, the county of Kirchberg and the lordship of Weissenhorn. Ulrich Fugger (1441–1510) devoted himself specially to commerce with Austria. Jacob Fugger (1459–1525) farmed the mines in Tyrol, accumulating immense wealth; he lent enormous sums to various potentates, and built the magnificent castle of Fuggerau, in Tyrol.

But it was under Charles V. that the house attained its greatest splendour. Jacob having died childless, and the family of Ulrich being also extinct, the fortunes and splendour of the house rested on the sons of George Fugger, who died in 1506. His two younger sons, Raimund and Antony, carried on the business, and became the founders of the two chief and still flourishing lines of the house of Fugger. The two brothers were zealous Catholics, and with their wealth supported Eck in his opposition to Luther. During the diet held by Charles V. at Augsburg in 1530 the emperor lived in Antony Fugger's splendid house in the Wine Market. On this occasion he raised both brothers to the rank of counts, and invested them with the still mortgaged properties of Kirchberg and Weissenhorn; and a letter under the imperial seal conferred on them the rights of princes. The Emperor Ferdinand II. raised the splendour of the house of Fugger still higher by conferring great additional privileges on the two oldest of the family, Counts John and Jerome. The Fuggers continued still as nobles to carry on their commerce, and further increased their immense wealth. They attained the highest posts in the empire, and several princely houses prided

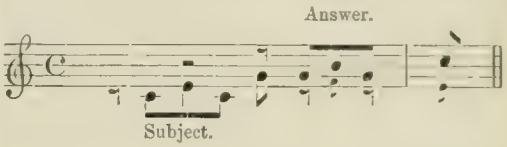
themselves on their alliance with the house of Fugger. They possessed the most extensive libraries and art collections, maintained painters and musicians, and liberally encouraged art and science. Their houses and gardens were masterpieces of the architecture and taste of the times. While thus indulging in splendour, they were not less bent on doing good. Jacob (the second of the name) bought houses in one of the suburbs of Augsburg, pulled them down, and built 108 smaller houses (called the 'Fuggerei'), which he let to poor citizens at a low rent. The race is still continued in the two principal lines of Raimund and Antony, besides collateral branches. The domains are chiefly in Bavaria. See Kleinschmidt. *Augsburg, Nurnberg, und ihre Handelsfürsten* (1881).

Fugitation, the Scottish equivalent of Outlawry (q.v.) in England.

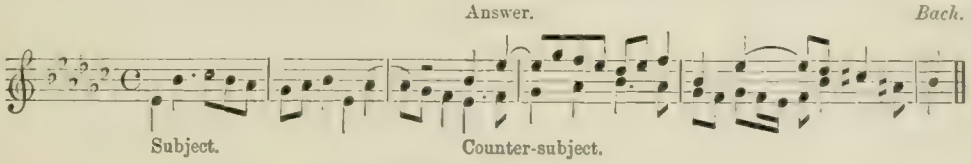
Fugitive Slave Law. The constitution of the United States of America having recognised slavery, or 'service,' as it was termed, provided that persons held to service or labour in one state, under the laws thereof, and escaping into another, should be delivered up, on claim of the party to whom such service or labour might be due. An act passed by congress in 1793, providing for the reclamation of fugitives, was superseded by a more stringent act in 1850, containing many obnoxious provisions; a larger fee, for instance, was paid to the judicial officer when the person arrested was adjudged to be a slave than when he was declared free; and all citizens were required, when called upon, to render the officers personal assistance in the performance of their duties. Any assistance rendered to a fugitive, or obstruction offered to his arrest, was penal, and many persons were remanded under the act; but the increased hostility to slavery which it engendered actually led to assistance being given in a larger number of escapes than ever before, mainly through the organisation known as the 'underground railroad.' The act was repealed after the outbreak of the civil war; and, since slavery has been abolished, the constitutional provision has lost all importance.

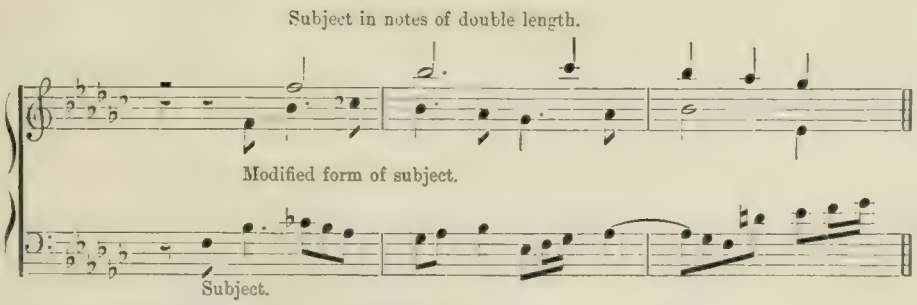
Fugleman (Ger. *flügelmann*, 'a man placed at the end of a file;' from *flügel*, 'a wing'), an intelligent soldier posted in front of a line of men at drill, to give the time and an example of the motions in the manual exercises.

Fugue is the form of musical composition in which all devices of counterpoint, or the art of combining independent ideas in music, find their most fitting use. The laws which govern it are as strict as numerous, and can only be very generally summarised. The 'subject' chosen as the basis of the composition should present a complete and distinct individuality, which to be readily recognised in its permutations should be well marked. It is given out by any one part, and immediately taken up by a second—its follower or *pursuer* (*fuga*, 'a flight'). This 'answer,' as it is called, is identical in form with the subject, or slightly modified in accordance with a rule which requires the upper division of the octave (G to C in the scale of C) to correspond to and 'answer' the lower (C to G). During the

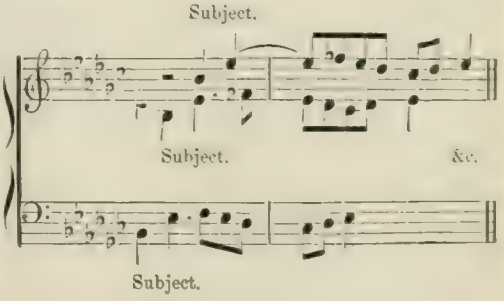


'answer' the first part supplies an accompaniment or 'counter-subject,' which should be a figure of contrasted character, and interesting enough to enable





it to play its important part in the subsequent development. A third part joins by enouncing the subject, while a fourth, fifth, even a sixth part may be added, entering alternately with the answer, subject, and answer. The introduction of all the parts constitutes the first section, and is called the 'exposition.' During the development, which finds its place in the second section, the composer should show his skill in the use of imitation, canon, &c., and so arrange his material that the intricacy and interest gradually increase. Before the conclusion of the fugue he should present a *stretto*, in which the parts press on and overlap each other in their enunciations of the subject.



A 'pedal point'—a bass note held while the upper parts move in as skilful a complication as the composer can devise—usually precedes the final cadence. 'Episodes,' or matter connected or in character with the subject, may be introduced throughout the development to afford variety, but these must be short, and must not be allowed to distract the attention. When two or three subjects are treated simultaneously the fugue is called double or triple.

Formulated early in the history of modern music, the vocal fugue was elaborated during the 'golden age of counterpoint' in the end of the 16th century. A new world was opened to it by Frescobaldi, who freed it from the limitations of the human voice, and first wrote instrumental fugues. Sebastian Bach, in his vocal and instrumental fugues, shows a genius which has never been rivalled. Mendelssohn was peculiarly gifted in this branch of composition, and many vocal fugues with most brilliant and effective instrumental accompaniments are to be found in his oratorios.

Although fugues in composition and performance have always been more or less 'caviare to the general,' the opinion of sound musicians in the present as well as the past is unanimous as to their value, interest, and the beauty of those by the standard writers. Details in construction have continually changed and developed during the three centuries of the existence of fugues, and text-books are as numerous as teachers. Those by Sir F. Gore Ouseley (prescribed at Oxford University); Jadassohn and his predecessor, Richter, of Leipzig Conservatorium; and Dr Higgs' Primer are probably of more use to-day than the famous works of Albrechtsberger, Reicha, &c. Bach's *Art of Fugue* is a collection of fifteen fugues, four canons, &c. on one subject—a practical and invaluable illustration from the hand of the greatest master of counterpoint. See article 'Fugue' in Stainer and Barrett's *Dictionary of Musical Terms*.

Fühnen. See FÜNEN.

Fuji-san. See FUSIYAMA.

Fu-kian, or FU-CHIEN, an eastern maritime province of China (q.v.).

Fulahs, also FULBE, FÉLLANI, FELLÁTA, and PEULHS, a people of the Soudan, extending from Senegal in the west to Darfur in the east, and from Timbuktu and Haussa in the north to Joruba and Adamawa in the south. Their ethnographic relations are not yet definitively settled, some allying them with the Soudan negroes, some with the Nuba of the Nile region, others regarding them as an isolated race. We first read of them about the beginning of the 14th century in Ahmed Baba's *History of Soudan*. After that century large bands of them left their home on the confines of Senegambia—i.e. Futa-Jallon—and, proceeding eastwards, spread themselves over the greater portion of the Soudan. There appear to be two distinct branches, a dark-skinned division, having its centre in Bornu and Adamawa, and an olive-skinned division, occurring chiefly in Sókoto. All are strong and well-built, with long hair and regular Caucasian features. They are very intelligent, have a frank, free bearing, are trustworthy, possess considerable self-respect and decision of character, and are devoutly religious. They probably number 7 to 8 millions altogether. The Fulahs are a conquering *race*, not a homogeneous *nation*; and have founded several kingdoms throughout central and southern Soudan, as those of Sókoto, Gando, Massina, and Adamawa. The numerous tribes belonging to their stock are generally divided into four groups or families—the Jel, the B'aá, the Só, and the Berî. Most of them became converted to Mohammedanism about the middle of the 18th century; in 1802, under the Imám Othman, they commenced a religious war on the surrounding pagans, which terminated in the establishment of the great Fulah empire of Sókoto. The Fulahs are an industrious people: they practise agriculture, rear cattle, and carry on trade; they also work iron and silver, manufacture with great neatness articles in wood and leather, and weave various durable fabrics. They have mosques and schools in almost all their towns. See Crozals, *Les Peulhs* (Paris, 1883).

Fulcrum, in Mechanics, is the prop or fixed point on which a lever moves. See LEVER.

Fulda, a town of the Prussian province of Hesse-Nassau, 67 miles NE. of Frankfort on the Main by rail, and on the river Fulda, is an irregularly built old town, still partially surrounded by its ancient walls. It is principally celebrated for its Benedictine abbey, founded by St Boniface (q.v.), the 'Apostle of Germany,' in the 8th century, which subsequently became a great centre of missionary enterprise as well as a notable seat of theological learning. Towards the end of the 10th century its abbot was made primate of all the abbeys of Germany. Having become corrupted and subject to many abuses, the monastery was thoroughly reformed in the early part of the 10th century by the introduction of new monks from abroad. The cathedral, six times destroyed by fire, was rebuilt in 1704–12 on the plan of St Peter's at Rome. It is 324 feet long, and covers the crypt of St Boniface. The Romanesque church of St Michael (1822) was restored in 1854. In the library is Boniface's copy of the Gospels, besides other valuable MSS. and early printed books. The town has manufactures of various textiles, with dyeing, tanning, and the making of wax candles. Pop. (1875) 10,799; (1890) 13,125. Fulda, which owed its existence to the abbey, was created a town in 1208, and from the 16th century onwards had a very eventful history, being taken in the Peasants' War, the Thirty Years' War, and the Seven Years' War. From 1734 to 1804 it possessed a university. During the *Kulturkampf* it was one of the strongholds of the German Ultramontane party. See works by Gegenbaur (1874) and Schneider (1881).

Fulgurites (Lat. *fulgur*, 'lightning'), tubes due to the action of lightning. They have been most frequently observed in loose sandhills, but have often been detected also in more compact rock. They are formed by the actual fusion of the materials through which the lightning passes. The internal surface of the tubes met with in sandhills is completely vitrified, glossy, and smooth—the thickness of the wall varying from $\frac{1}{30}$th to $\frac{1}{70}$th of an inch, while the diameter of the tubes ranges up to 2½ inches. They usually, but not always, descend vertically from the surface, sometimes dividing and subdividing, and rapidly narrowing downwards till they disappear. Fulgurites have often been detected on mountain-tops. In some cases the rocks attacked by lightning have the appearance of being covered with a black scoriaceous plaster, which looks as if it had 'run' or dripped. In other cases the rocks are described as being drilled—the holes produced by the lightning being lined internally with dark glassy substance. Fulgurites were first observed in 1711 by the pastor Herman, at Massel, in Silesia, and have since been found in many places; but their origin was first pointed out by Dr Hentzen in 1805.

Fulham, formerly a village, but now a suburb of London, in the south of Middlesex, on the left bank of the Thames, 4½ miles SW. of Charing Cross. Here since 1141 has been the palace of the bishops of London, but the present building is

mostly not more than a century old. The church contains the tombs of many of the bishops; and the place also has memories of Bodley, Florio, Richardson, Hallam, Crotch, and Albert Smith.

Fulgentius (468–533), bishop of Ruspe in Numidia, was banished to Sardinia, and there wrote against Arians and Pelagians.

Fuller, ANDREW, an eminent Baptist theologian and controversialist, was born, the son of a small farmer, at Wicken, Cambridgeshire, February 6, 1754. He had his education at Soham free school, but at an early age had to turn to farm-work. In his seventeenth year he became a member of a Baptist church at Soham, and soon began to speak with such acceptance that in 1775 he was chosen pastor of a congregation there. His small stipend of £21 per annum he endeavoured to increase by keeping, first a small shop, and then a school. In 1782 he removed to a pastorate at Kettering, in Northamptonshire. His treatise, *The Gospel worthy of all Acceptation* (1784), involved him in a warm controversy with the ultra-Calvinists, but showed him already a theologian of rare sagacity and insight, and still rarer fearlessness and sincerity. On the formation in 1792 of the Baptist Missionary Society by Dr Carey and others, he was appointed its secretary, and he devoted henceforward the whole energies of his life to its affairs. His controversial treatise, *The Calvinistic and Socinian Systems examined and compared as to their Moral Tendency* (1793), was attacked by Dr Toulmin and Mr Kentish; but Fuller replied vigorously in his *Socinianism Indefensible* (1797). Other works are *The Gospel its own Witness* (1797), an onslaught on Deism, and *Expository Discourse on the Book of Genesis* (1806), besides a multitude of single sermons and pamphlets. He died May 7, 1815. His complete works were collected in 1831, and re-issued in 1845 with a memoir by his son.

Fuller, GEORGE, an American artist, was born in Deerfield, Massachusetts, in 1822. As early as 1857 his work attracted attention, and during the last years of his life his pictures were warmly admired by many for their richness of tone and peculiar handling, though they never appealed to the popular taste. He died 21st March 1884. An exhibition of his paintings was held in Boston in that year, and a costly memorial work on his life and genius was published there in 1887.

Fuller, SARAH MARGARET, MARCHIONESS OSSOLI, author, was born at Cambridgeport, Massachusetts, May 23, 1810. She received much of her early education from her father, Timothy Fuller, a hard-working lawyer and congressman, after whose death (1835), intestate and insolvent, she assisted her family by school and private teaching. In Boston the leaders of the transcendental movement were her intimate friends; here she edited *The Dial*, translated from the German, and wrote *Summer on the Lakes* (1843). In 1844 she published *Woman in the Nineteenth Century*, and in the same year she proceeded to New York, on the invitation of Horace Greeley, then editor of the *Tribune*, and contributed to that journal a series of miscellaneous articles, which afterwards appeared in a collected form as *Papers on Literature and Art* (1846). In 1846 she went to Europe, where she made the acquaintance of many eminent people; and in 1847, at Rome, she met the Marquis Ossoli, to whom she was married in December of that year. She entered with enthusiasm into the struggle for Italian independence. In 1849, during the siege of Rome, she took the charge of a hospital; and on the capture of the city by the French she and her husband, after a period of hiding in the Abruzzi, and a few months at Florence, sailed with their infant from Leghorn for America, May 17, 1850. The vessel was driven on the shore of Fire Island, near New York, by a violent gale in the early morning of July 16; the child's body was found on the beach, but nothing was ever seen afterwards of Margaret Fuller or her husband. Her Autobiography, with memoirs by Emerson, Clarke, and Channing, appeared in 1852 (new ed. 1884); there are also lives by Julia Ward Howe (1883) and T. W. Higginson (Boston, 1884, 'American Men of Letters' series).

Fuller, THOMAS, divine, historian, and wit, was born in 1608 at Aldwinkle St Peter's, Northamptonshire, elder son of the painful preacher, its rector and prebendary of Sarum, and of his wife, Judith Davenant. At his baptism (June 19) his godfathers were his two uncles, Dr Davenant, president of Queens' College, Cambridge, and Dr Townson, both of whom became in succession bishops of Salisbury. The boy early showed striking promise, and was in 1621 entered at Queens' College, Cambridge, where he graduated B.A. in 1625, and M.A. in due course three years later. Being unaccountably passed over in an election of fellows of his college, he was transferred in 1628 to Sidney Sussex College, and in 1630 received from Corpus Christi College the curacy of St Benet's, where he preached those *Lectures on the Book of Job* which he published in 1654. Next year his uncle gave him a prebend in Salisbury, in 1634 he was appointed to the rectory of Broadwinsor in Dorsetshire, and in 1635 he proceeded B.D. Already in 1631 he had published his first work, an ingenious but indifferent poem of 124 seven-lined stanzas, in three parts, entitled *David's Heinous Sin, Hearty Repentance, and Heavy Punishment;* and here he fulfilled faithfully the duties of a parish priest, married happily, and compiled his first ambitious work, the characteristically bright, vigorous, and quaint *History of the Holy War* (1639), embracing the story of the Crusades, as well as *The Holy and Prophane States* (1642), a unique collection of essays and characters, full of shrewdness, wisdom, and kindliness, lightened up on every page by the most unexpected humour, and by marvellous felicity of illustration. In 1640 Fuller sat as proctor for Bristol in the Convocation of Canterbury, and was one of the select committee appointed to draw up canons for the better government of the church. In the same year he published his *Joseph's parti-coloured Coat*, a comment on 1 Cor. xi. 18–30, with eight sermons full of the true Fuller flavour. Soon after he removed to London to become an exceedingly popular lecturer at the chapel of St Mary Savoy. In the exercise of his function he strove to allay the bitterness of party-feeling, but when the inevitable war broke out he adhered with fearless firmness to the royal cause, and shared in its reverses. Yet his characteristic moderation of tone offended the more hot-headed among the royalists, who misread his temperance into lukewarmness. He saw active service as chaplain to Hopton's men, and printed at Exeter in 1645 for their encouragement his *Good Thoughts in Bad Times*, a manual of fervid and devout short prayers and meditations, which was followed in 1647 by a second, *Better Thoughts in Worse Times*, and by his twenty-one short dialogues, *The Cause and Cure of a Wounded Conscience*. In the same year he began again to preach, at St Clement's, Eastcheap, but was soon suspended. His enforced leisure he gave with indomitable industry to study and compilation, being helped the while by patrons who knew his merit. One of the kindest of these was the Earl of Carlisle, who made him his chaplain, and presented him to the curacy of Waltham Abbey, which Fuller managed to keep throughout the troubles by passing the ordeal of Cromwell's Tryers. In 1650 he published his great survey of the Holy Land, full of maps and engravings, *A Pisgah-sight of Palestine*,

where for once geography became a peg whereon to hang alternate wit, wisdom, and edification. The very rocks and deserts are fertilised by his fancy, and not one of his 800 pages is dry or tedious. In 1651 appeared *Abel Redevivus*, a collection of religious biographies, of which Fuller himself wrote seven. His first wife had been already dead ten years when in 1651 he married a sister of Roper, Viscount Baltinglass. In 1655 he published in a folio volume his long projected *Church History of Britain*, from the birth of Christ till the year 1648, divided into eleven books, a twelfth being a *History of the University of Cambridge*. The early books are divided into centuries, the later into sections, and in both the paragraphs are duly labelled and numbered with much ostentation of method, despite the perpetual digressions into heraldry and the like 'for variety and diversion . . . to divert the wearied reader.' Each book is dedicated to some noble patron, and a dedication is prefixed to every century or section. Altogether there are no fewer than 75 dedicatory epistles, addressed to 85 patrons or patronesses, of whom many, he tells us, 'invited themselves on purpose to encourage my endeavours.' The work was bitterly assailed by Dr Peter Heylin with no less than 237 several 'Animadversions' in his *Examen Historicum* (1659), as a rhapsody rather than a history, full of 'impertinencies' as well as errors, and still worse marred by partiality to Puritanism. Fuller at once replied in *The Appeal of Injured Innocence*, in which he gives his animadvertor's own words in their entirety followed by his own replies *seriatim*. Nowhere is his strong sense sharpened into bright and stinging wit more conspicuous than here. Moreover, broad, open-minded candour and large toleration to all honest opinion and fair argument, wedded to intense personal loyalty to his own church, are characteristic notes throughout, while it would be difficult to find a nobler example in our literature of magnanimous Christian charity tremulous with pathos than the concluding epistle to his antagonist. Bishop Nicolson, in *The English Historical Library* (2d ed. 1714), failing with one-eyed vision to see that he had before him an English classic, and one *sui generis* moreover, laments the lack of 'the gravity of an historian,' and the weakness for 'a pretty story' and for 'pun and quibble,' yet in his superior manner admits that, 'if it were possible to refine it well, the work would be of good use, since there are in it some things of moment hardly to be had elsewhere, which may often illustrate dark passages in more serious writers.'

Fuller had been presented by Lord Berkeley in 1658 to the rectory of Cranford in Middlesex, and at the Restoration he was reinstated in his former preferments. In that year he published his *Mixt Contemplations in Better Times*, was admitted D.D. at Cambridge by royal mandate, and appointed chaplain-in-extraordinary to the king. Apparently also he would have been made a bishop had he lived. He died in London after a few days' illness of the 'new disease'—a kind of typhus fever, 16th August 1661, and was buried in the chancel of Cranford church. The Latin epitaph inscribed on a mural tablet there is not so brief as his own suggestion—'Here lies Fuller's earth,' but contains a conceit worthy of his own pen, how that while he was labouring to give others immortality he obtained it himself. His great work, *The Worthies of England*, left unfinished, was edited by the pious care of his son, and published in 1662. Fuller tells us elsewhere of his 'delight in writing of histories,' and we know that the preparation of his greatest work covered nearly twenty years of his troubled life. At the outset he sets forth his five ends in the book—each one sufficient in itself: 'to gain some glory to God, to preserve the memories of the dead, to present examples to the living, to entertain the reader with delight, and to procure some honest profit to myself.' The first four were most to Fuller, and all these he gained. The *Worthies* is a magnificent miscellany of facts about the counties of England and their illustrious natives, lightened up by unrivalled originality, spontaneity, and felicity of illustration, and aglow with the pure fervour of patriotism—the very apotheosis of the gazetteer.

The earliest and anonymous biographer of Fuller tells us that his stature was somewhat tall, 'with a proportionable bigness to become it,' his countenance cheerful and ruddy, his hair light and curly, his carriage such as could have been called 'majestical' but for his complete lack of pride, his deportment 'much according to the old English guise.' Such also is the Berkeley portrait, reproduced in Bailey's *Life*. His genial disposition, the charm of his company, and his marvellous feats of memory are mentioned by Pepys and all who have since written of him.

Of the judgments passed upon his genius, best known and hardly exaggerated is that of Coleridge: 'Wit was the stuff and substance of Fuller's intellect. It was the element, the earthen base, the material which he worked in; and this very circumstance has defrauded him of his due praise for the practical wisdom of the thoughts, for the beauty and variety of the truths, into which he shaped the stuff. Fuller was incomparably the most sensible, the least prejudiced, great man of an age that boasted a galaxy of great men.' His wit is fast wedded with wisdom and strong sense, and with all its freedom is never unkindly or irreverent—he 'never wit-wantoned it with the majesty of God.' He lays a spell of quite a peculiar kind upon his reader, who will either return to him often or neglect him altogether. His style shows admirable narrative faculty, with often a nervous brevity and point almost new to English, and a homely directness ever shrewd and never vulgar; while 'his wit,' says Charles Lamb, 'is not always a *lumen siccum*, a dry faculty of surprising; on the contrary, his conceits are oftentimes deeply steeped in human feeling and passion.' The pen that described negroes as 'the images of God cut in ebony' was that of a good man as well as a great writer.

See the fine 17th-century anonymous eulogy reprinted in vol. i. of J. S. Brewer's edition of the *Church History* (Clarendon Press, 6 vols. 1845); Rev. Arthur T. Russell's *Memorials of Dr Fuller's Life and Works* (1844); Henry Rogers' *Selections and Essay* (1856); J. E. Bailey's *Life of Thomas Fuller* (1874), his article in *Encyclopædia Britannica*, and his edition of the *Collected Sermons* (1891); the *Life* by Rev. Morris Fuller (2d ed. 1886); and Jessopp's selections (1892). Bailey's unique collection of books relating to Fuller was acquired by the Manchester Free Library in 1889.

Fuller's Earth, a mineral consisting chiefly of silica, alumina, and water, with a little magnesia, lime, and peroxide of iron. The silica is about 53, the alumina 10, and the water 24 per cent. of the whole. It is regarded as essentially a hydrous bisilicate of alumina. It occurs in beds, associated with chalk, oolite, &c.; is usually of a greenish-brown or a slate-blue colour, sometimes white; has an uneven earthy fracture and a dull appearance; its specific gravity is from 1·8 to 2·2; it is soft enough to yield readily to the nail; is very greasy to the touch; scarcely adheres to the tongue; falls to pieces in water with a hissing or puffing sound, but does not become plastic. It has a remarkable power of absorbing oil or grease; and was formerly very much used for fulling cloth (see WOOLLEN MANUFACTURE), for which purpose it was considered so valuable that the exportation

of it from England was prohibited under severe penalties; it is still used to a considerable extent. The annual consumption in England is said to have at one time exceeded 6000 tons. It is found at Nutfield, near Reigate, in Surrey, in cretaceous strata, where it forms a bed varying in thickness from less than 8 feet up to 12 feet or more. The lower part of this bed is blue, but, owing to the peroxidation of iron, the upper portion is buff-coloured—the change being brought about by the infiltration of water. It is also found in Bedfordshire, Nottinghamshire, Kent, Surrey, and elsewhere. There is a considerable deposit of it at Bath, where the group of associated blue and yellow clays and marl has received the name of 'the Fuller's Earth Series,' belonging to the Jurassic system. It is also found at Maxton in Scotland, and at various places on the Continent, as in Saxony, Bohemia, and near Aix-la-Chapelle.

Fuller's Herb or **Teasel.** See TEASEL.

Fullerton, LADY GEORGIANA, writer of religious novels, daughter of the first Earl Granville, was born at Tixall Hall, Staffordshire, 23d September 1812, and in 1833 married Alexander Fullerton. Two years after publishing her first story, *Ellen Middleton* (1844) she became, under the influence of the Tractarian movement, a convert to Catholicism. The rest of her life was devoted to charitable works and the composition of religious stories: *Grantley Manor* (1847), *Constance Sherwood* (1864), *A Stormy Life* (1864), *Mrs Gerald's Niece* (1871), *Gold-digger and other Verses* (1872). She died at Bournemouth, 19th January 1885. See her Life by Father Coleridge, from the French of Mrs Craven (1888).

Fulmar, or FULMAR PETREL (*Fulmarus*), a genus of sea-birds, in the family Procellariidæ, beside the albatross, the storm petrel, and the puffin, and near the gulls (Laridæ). The genus includes some forty species, which are widely distributed and strictly oceanic. The members agree in general features with the petrels proper (Procellaria), and all possess strong hooked bills. The general appearance is gull-like; the wings long and the flight powerful; the tail short; the hind-toe reduced to a sharp clawed wart. They are said to defend themselves from attack by disgorging an ill-flavoured oily secretion from the alimentary canal.

The best-known species, the common Fulmar (*F. glacialis*), frequents the northern seas in numbers so immense that Darwin awards it the somewhat unverifiable credit of being the most abundant of birds. It is a rarity on British or indeed European coasts, but nests or at least used to nest in St Kilda, Skye, Barra, and Foula, and is common farther north in the Faroes, Iceland, Spitzbergen, and similar localities. The bird is about the size of a duck, has the general colouring of the common gull (*Larus canus*), and is well known as the Greedy Molly-mawk, which, with beautiful gliding flight, follows whalers and other vessels after they get north of Shetland. It feeds on fishes, molluscs, jelly-fish, on the offal of the Newfoundland cod-fisheries, on the debris thrown from the successful whalers, and is in fact an indiscriminately carnivorous bird, with a preference for blubber. On a dead whale they are said to glut themselves till they are unable to fly, and sailors not unfrequently catch them with lines and hooks baited with fat. From living whales they are said to pick the Cirripedes parasitically imbedded in the skin. They breed on rocky shores, but there is no nest worth mentioning. Although the individuals are so numerous, there is only a single egg, which has a white colour.

Fulmar (*Fulmarus glacialis*).

The greedy fulmar is of no little use to the natives of the regions where it abounds. Both eggs and young are collected and eaten, and the birds are also valued for their down and oil. In St Kilda the quest for fulmars used to be an important and extremely perilous means of livelihood, while it is said that in a single little island, Westmanæyjar, south of Iceland, over 20,000 of the strong-smelling, uninviting, young fulmars are salted every summer for winter fare. The oil, which is obtained from the flesh and stomach, is amber-coloured, and has a peculiar, persistent, and unpleasant smell. From the Pacific, *F. pacificus* is usually distinguished; and the large *F. giganteus* from southern regions is also worthy of note. See PETREL.

Fulminates. This term is applied to a class of salts having the same percentage composition as the cyanates (see CYANOGEN), but, unlike them, exploding violently when heated or struck. Like Gun-cotton (q.v.) and Dynamite (q.v.) these salts contain the group of atoms represented by the formula NO_2, and which seems to confer explosive properties in so many cases. There are many fulminates corresponding to the different metals, but it will suffice if attention is drawn to fulminating mercury and silver. *Fulminating mercury* is prepared by heating mercury with alcohol and nitric acid, and after purification it is obtained in white silky crystals, which have a sweetish taste and are soluble in water. When moist these crystals may be handled without risk of explosion, but when dry they detonate violently on being struck or when a spark falls on them. This salt is largely used in the manufacture of percussion caps, for which purpose it is mixed with nitre, sulphur, &c. *Fulminating silver* is prepared by heating a solution of nitrate of silver with nitric acid and alcohol. It forms small white needles having a bitter taste and poisonous properties. It explodes more readily than the mercury salt, and the greatest care is requisite in its manufacture. It is used in making crackers and other detonating toys.

The fulminates should never be prepared by amateurs, as accidents very readily occur.

Fulnek, a town of Moravia, 10 miles NNW. of Neutitschein, with a Capuchin convent, and manufactures of silk, cloth, and fezes. Pop. 3692. Fulnek was formerly a principal seat of the Moravian Brethren, and gave its name to *Fulneck* in Yorkshire, 5½ miles E. of Bradford, where a Moravian settlement was established in 1748.

Fulton, ROBERT, a celebrated American engineer, was born of Irish parents in 1765 in what is now Fulton township, Pennsylvania. The years

1782–85 were spent in Philadelphia, where he devoted himself to the painting of miniature portraits and landscapes. In 1786 he proceeded to London, where for several years he studied under West; but some paintings which he produced in Devonshire having gained him the patronage of the Duke of Bridgewater and Earl Stanhope, he abandoned art and applied his energies wholly to mechanics, for which he had early shown a strong bent. In 1794 he obtained from the British government a patent for a double-inclined plane, the object of which was to set aside the use of locks; and in the same year he invented a mill for sawing and polishing marble. He afterwards prepared plans for the construction of cast-iron aqueducts and bridges, and patented in England a machine for spinning flax, a dredging machine, and several boats. He was received as a civil engineer in 1795, and published a treatise advocating small canals. In 1797 he proceeded to Paris, where he remained for several years, devoting himself to new projects and inventions, amongst which was a submarine boat, intended to be used in torpedo warfare, but neither the French nor the British government, which he next tried, could be induced to take his invention up, although commissions were appointed in both cases to test its value. Having failed in this matter, he next turned his attention to a subject that had occupied his mind as early as 1793—the application of steam to navigation. In 1803 he launched on the Seine a small steamboat, which immediately sank; but a trial-trip was made by a second boat soon after, though without attaining any great speed. In 1806 he returned to New York and pursued his experiments there. He perfected his Torpedo (q.v.) system, though it was never actually adopted; and in 1807 he launched a steam-vessel upon the Hudson, which made a successful start on the 11th August, and accomplished the voyage up the river (of nearly 150 miles) to Albany in thirty-two hours. From this period steamers (for the construction of which Fulton received a patent from the legislature) came into pretty general use upon the rivers of the United States. Although Fulton was by no means the first to apply steam to navigation, yet he was the first to apply it with any degree of practical success (see SHIPBUILDING). His reputation was now firmly established, and he was employed by the United States government in the execution of various projects with reference to canals and other works. In 1814 he obtained the assent of the legislature to construct a steam war-ship, which was launched in the following year, but never tested in warfare. Though the labours of Fulton were attended with such great success, various lawsuits in which he was engaged in reference to the use of some of his patents kept him in constant anxiety and tended to shorten his days. He died at New York, 24th February 1815. See his Life by Colden (New York, 1817); *Robert Fulton and Steam Navigation*, by Thos. W. Knox (1886), and the article SUBMARINE NAVIGATION.

Fum, or, more properly, FUNG, the Chinese Phœnix, one of the four symbolical animals supposed to preside over the destinies of the Chinese empire. Its appearance indicates an age of universal virtue, the influence of which has extended throughout creation. It is supposed to have the forepart of a goose, hind-quarters of a stag, neck of a snake, fish's tail, fowl's forehead, down of a duck, dragon's marks, the back of a tortoise, face of a swallow, and beak of a cock, with claws and feathers of various colours, red crest, and golden beak. It is about six cubits high, and comes from the East.

Fumage. See HEARTH-MONEY.

Fumariaceæ, an order of dicotyledonous herbs, allied to Papaveraceæ, of which they may be regarded as specialised forms. There are about a hundred species, mostly palæarctic, and mostly weeds, but some of great beauty (see DICENTRA). Several species of Fumaria and Corydalis are natives of Britain. The Common Fumitory (*Fumaria officinalis*) is a very common annual weed in gardens and cornfields, rank, yet of rather delicate and beautiful appearance, and easily extirpated. It was formerly much employed in medicine, as also in dyeing, and as a source of potash.

Common Fumitory (*Fumaria officinalis*).

Fumaric Acid, $H_2C_4H_2O_4$, occurs in many plants, especially in Corydalis and Fumitory. It is of interest from a chemical point of view as being isomeric with malic acid.

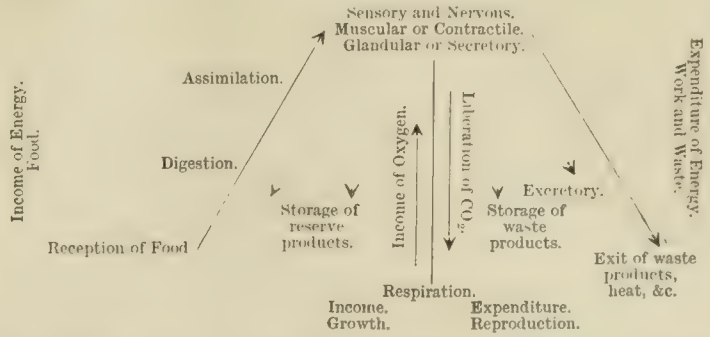
Fumigation (Lat. *fumigatio*, from *fumus*, 'smoke'), the cleansing or medicating of the air of an apartment by means of vapours, employed chiefly for the purpose of detaching infectious poisons from clothing, furniture, &c. Most of the methods of fumigation formerly employed have little real value, and are to be looked on chiefly as grateful to the senses, as, for instance, the burning of frankincense, camphor, &c. The really active processes are noticed under the article DISINFECTANTS. See also DEODORISERS, CONTAGION, INFECTION, GERM THEORY, PASTILLES.

Funaria, a genus of Mosses, of which one species common on old walls and dry barren soils, *F. hygrometrica*, is of particular interest on account of the hygrometric twisting of its fruit-stalk.

Funchal, the capital of the island of Madeira (q.v.), situated on the south side of the island, is, in spite of its exposed harbour and unsatisfactory roadstead, the chief port and commercial town of the island. Pop. 30,606. It attracts a few hundred visitors every year by the salubriousness of its climate, and has a consumptive hospital, a cathedral, Anglican and Presbyterian churches, and an English club.

Function, the technical term in physiology for the vital activity of organ, tissue, or cell. Thus it is the dominant function of the pancreas to secrete digestive juice, of a muscle to contract, of a sensory cell to receive and pass on external stimulus. The classification of the various functions or vital processes presents considerable difficulty, though it is easy enough roughly to catalogue the most important: (1) contractility (by muscular cells, tissues, and organs); (2) irritability to sensory stimulus, transmission of nervous stimulus, 'automatic' origin of nervous impulse (by sensory organs, nerves, brain, &c.); (3) secretion and excretion (by glandular cells, or complexes of these); (4) respiration (by skin, gills, lungs, &c., or necessarily in every actively living cell); (5) nutrition, digestion, assimilation (in the manifold ways in which the income of energy in the form of food is received and worked up into living matter). Somewhat apart from these, and of more

periodic occurrence, are the great processes of growth and reproduction. Or the various vital phenomena may be thus arranged in diagrammatic fashion :



In a single-celled organism, such as an Amœba, all the vital processes take place within narrow limits, and just because of the simplicity of structure there must be great complexity of function compared with what occurs in a single cell of one of the higher organisms. For here division of labour is possible, and in the different cells special functions predominate over the others. Thus, a muscle-cell is contractile but not strictly nervous, and a glandular cell is secretory without being definitely contractile. With the division of labour and resultant complexity of structure in a higher organism, various functions appear which are only foreshadowed in a protozoon. Such, for instance, is the circulatory function, establishing nutritive and respiratory communication between the distant parts. But such a multiple process can readily be seen to be the sum of several more fundamental functions. It must also be noted that, while a cell, tissue, or organ may have one dominant function, it may at the same time retain several subfunctions.

Another fact of general importance is the change of function which may be exhibited by the same organ in the course of its history—that is to say, through an ascending series of animals, or even in the development of an individual. Thus, what is a mere bladder, of little apparent account, near the hind end of a frog's gut, becomes the respiratory and sometimes nutritive Allantois (q.v.) of reptile and bird, and an important part of the Placenta (q.v.) in placental mammals. The importance of this in relation to the general theory of evolution has been emphasised by Dohrn in what he terms the principle of functional change.

Fundamentally, the functions of organs, the properties of tissues, the activities of cells, are reducible to chemical changes in the living matter or protoplasm. To the constant change in the protoplasm the general term 'metabolism' is applied, while this is again subdivided into processes of upbuilding, construction, chemical synthesis, or 'anabolism,' and reverse processes of down-breaking, chemical disruption, or 'katabolism.' See Amœba, Biology, Cell, Physiology, Protoplasm, and the various functions, Digestion, &c.—In speaking of disease, 'functional' is opposed to 'organic.'

Function. When two quantities are so related that a change in the one produces a corresponding change in the other, the latter is termed a *function* of the former. For example, the area of a triangle is a function of the base, since the area decreases or increases with the decrease or increase of the base, the altitude remaining unchanged. Again, if $u = ax^2 + bx + c$, where a, b, and c are constant quantities, and u and x variables; then u is said to be a function of x, since, by assigning to x a series of different values, a corresponding series of values of u is obtained, showing its *dependence* on the value given to x. Moreover, for this reason, x is termed the *independent*, u the *dependent* variable. There may be more than one independent variable—e.g. the area of a triangle depends on its altitude and its base, and is thus a function of two variables. Functionality, in algebra, is denoted by the letters F, f, ϕ, Φ, &c. Thus, that u is a function of x may be denoted by the equation $u = F(x)$; or, if the value of u depends on more than one variable, say upon x, y, and z, then by $u = F(x, y, z)$.

Functions are primarily classified as *algebraical* or *transcendental*. The former include only those functions which may be expressed in a finite number of terms, involving only the elementary algebraical operations of addition, subtraction, multiplication, division, and root extraction. Several terms are employed to denote the particular nature of such functions. A *rational* function is one in which there are no fractional powers of the variable or variables; *integral* functions do not include the operation of division in any of their terms; a *homogeneous* function is one in which the terms are all of the same degree—i.e. the sum of the indices of the variables in each term is the same for every term. For example,

$$x^4 + x^3y + x^2y^2 + xy^3 + y^4$$

is a rational, integral, homogeneous function of the fourth degree in x and y. *Transcendental* functions are those which cannot be expressed in a finite number of terms; the principal types are (1) the exponential function e^x, and its inverse, $\log x$; (2) the circular functions, such as $\sin x$, $\cos x$, $\tan x$, &c., and their respective inverses, $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$, &c.

Functions are also distinguished as *continuous* or *discontinuous*. Any function is said to be continuous when an infinitely small change in the value of the independent variable produces only an infinitely small change in the dependent variable; and to be discontinuous when an infinitely small change in the independent variable makes a change in the dependent variable either finite or infinitely great. All purely algebraic expressions are continuous functions; as are also such transcendental functions as e^x, $\log x$, $\sin x$, $\cos x$.

Harmonic or *periodic* functions are those whose values fluctuate regularly between certain assigned limits, passing through all their possible values, while the independent variable changes by a certain amount known as the period. Such functions are of great importance in the theory of sound, as well as in many other branches of mathematical physics. Their essential feature is that, if $f(x)$ be a periodic function whose period is a, then $f(x + \frac{1}{2}a) = f(x - \frac{1}{2}a)$, for all values of x.

The term *derived function* is used to denote the successive coefficients of the powers of h in the expansion of $f(x + h)$, where h is an increment of x. If x becomes $x + h$, then $f(x)$ changes to $f(x + h)$, and it may be shown that $f(x + h) = f(x) + f'(x)h + f''(x)\frac{h^2}{1.2} + f'''(x)\frac{h^3}{1.2.3}$ + &c.; $f'(x)$, $f''(x)$, $f'''(x)$, &c. are the first, second, third, &c. *derived functions* of $f(x)$. It is the primary object of the differential calculus to find the value of these for different kinds of functions.

Fund, SINKING. See SINKING FUND.

Fundi, or FUNDUNGI (*Paspalum exile*), a kind of grain allied to the millets, much cultivated in the west of Africa. See MILLET.

Funds. See NATIONAL DEBT.

Fundy, BAY OF, an arm of the Atlantic, separating Nova Scotia from New Brunswick, and branching at its head into two inlets, Chignecto Bay and Minas Basin, which are separated by narrow necks of land from the Gulf of St Lawrence. It has an extreme breadth of 45 miles and a length up to Chignecto Bay of 140 miles; it receives the St John, the principal river of New Brunswick, and the St Croix, which separates that province from Maine. The navigation is rendered perilous by the tides, which rush in with impetuous force, and have a range of 53 feet (not 100 feet), as at Chepstow.

Fünen, or FÜHNEN (Dan. *Fyen*), the largest of the Danish islands after Zealand, is separated from Sleswick and Jutland on the W. by the Little Belt, and from Zealand on the E. by the Great Belt. With the islands of Langeland, Ärö, Taasinge, &c., it forms the two administrative districts of Odense and Svendborg. Area of Fünen, 1135 sq. m.; pop. (1890) 221,084. The coast is for the most part flat and sandy; on the north it is indented by the deep Odense Fjord. The interior is flat, except towards the south and west, where there is a range of hills rising to about 420 feet. The land, which is well watered by several small streams, is fruitful and well cultivated, producing abundant crops of cereals. Barley, oats, buckwheat, rye, flax, hemp, honey, horses, and a fine breed of horned cattle are exported. The island is crossed by several railway lines. The principal towns are Odense (q.v.; pop. over 30,000), Svendborg (7500), and Nyborg (5500).

Funeral Rites, the customs attending the burial or other disposal of the bodies of the dead, the various practical methods of which are discussed under the article BURIAL. These ceremonies of course vary with the method preferred, whether of burial in the earth, exposure upon the tops of trees and towers as practised by the Parsees, or of burning in the usage of the ancient Greeks and later also the Romans. The effect of Christianity was to add a new sanctity to the body from the belief in its resurrection in a glorified form, hence the burial in places specially set apart for that purpose with more or less elaborate religious ceremonies, the washing, anointing, stretching, and swathing of the body in white robes (once in England only in woollens), the strewing of the coffin with palms and rosemary rather than cypress, and its position in the grave with face upward and feet to the east, towards the second coming of the Lord. Nowadays in Britain and America there are few distinctive customs beyond the religious rites, the wearing of black as a mourning colour, and the accompanying the body to the grave, expressive of respect; but formerly many customs were in use, as the ringing of the *passing* bell to drive off demons who might be in waiting for the newly-released soul; the constant watching with the dead betwixt death and burial—the *lykewake*—once universal, and still surviving, with degrading circumstances and without meaning, in the Irish wake; setting a plate of salt upon the breast of the body and lighted candles at its head; and the serving of profuse repasts of meat and drink to all and sundry, as well as special doles of food and clothing to the poor. Aubrey in his *Remaines of Gentilisme and Judaisme* tells us of a singular custom as having been formerly practised in Herefordshire, of a man eating a loaf of bread and drinking a bowl of beer over a dead body, and thereby symbolically taking upon himself the sins of the deceased. The analogy is obvious between the sin-eater and the scapegoat of the ancient Jewish Day of Atonement.

Funeral rites symbolise affection and respect for the deceased and grief for his loss, or they may be attempts to deprecate the ill-will of a now powerful ghost. The belief in the continuance of life beyond the grave is a universal human possession, and most savages attach ghost-souls also to animals and even inanimate objects, which may accompany the souls of men into the spirit-world as in life. Hence the meaning of the North American Indians burying bow and arrow with the dead, the old Norse warrior having his horse and armour laid beside him in his barrow, the Hindu widow's inveterate desire to be burnt herself to death together with her husband's body, the head-hunting of the Dyaks in order that a man may not be unprovided with slaves after his death, the burying of money together with the corpse and even the *obolus* for Charon's fee among the ancient Greeks, as well as such a survival as our own leading the trooper's horse behind his master's bier instead of burying him in his grave.

The funeral rites of the ancient Egyptians were most elaborate, but it is scarcely safe to claim their preference for embalming as conclusive proof of their belief in a resurrection of the body, as they embalmed animals as well as men, and did not preserve some of the most important internal parts of the human bodies they embalmed.

See the articles ANCESTOR-WORSHIP, BURIAL, EGYPT, and EMBALMING; for the religious significance of funeral rites in Herbert Spencer's theory of religion, his *Principles of Sociology*, but for a safer guide to interpretation, Tylor's *Primitive Culture* (vol. ii.); also for the facts, Feydeau, *Hist. générale des Usages funèbres et des sepultures des Peuples anciens* (3 vols. Paris, 1858); De Gubernatis, *Storia popolare degli usi funebri Indo-Europei* (1873); Tegg, *The Last Act* (1876); and Sonntag, *Die Todtenbestattung* (1878).

FUNERAL EXPENSES, in Law. If limited to the degree and quality of the deceased and the estate he has left, funeral expenses are a privileged debt, allowed before all other debts and charges, both in England and Scotland. If the parties primarily liable neglect the duty of giving decent burial to the dead, a stranger may do so, and claim reimbursement out of his effects. In Scotland it is held that moderate and suitable mourning for the widow and such of the children of the deceased as were present at the funeral is a valid charge; but the reverse is the case in England, it having been decided that the widow has no claim for mourning either against the executor or the creditors of her husband.

Fünfhaus, a suburb of Vienna lying SW. of the city. Its population is principally engaged in weaving, wood-turning, and building.

Fünfkirchen ('Five Churches,' from five mosques built during the Turkish occupation, in the 16th century; Hungarian, *Pecs*), a free town of Hungary, capital of the county of Baranya, on the vine-clad southern slope of the Mecsek Mountains, 139 miles S. by W. of Pesth by rail. Its bishopric was founded in 1009, and it is one of the oldest, as well as one of the most pleasantly situated and beautiful towns of Hungary. It formerly possessed

a university. The most important of its buildings are the Romanesque cathedral (1136), the bishop's palace, the town-house and hospital, and the county buildings. Its manufactures include leather, woollens and flannels, oil, brandy and liqueurs, and a famed majolica ware; it produces wine, fruit, and tobacco, and has coal-mines and marble-quarries, and a flourishing trade in hogs and gall-nuts. Pop. (1890) 34,067.

Fungi. The early botanists 'considered the fungi to be *lusus naturæ* and no plants at all,' and regarded their strange and fitful appearance without flower or apparent seed as the strongest argument for spontaneous generation. The bland wholesomeness of some, yet frightful poisonousness or destructiveness of many others, with their consequent world-old association with that crude and fanciful pharmacy in which ancient medicine and witchcraft were so inseparably intermingled, not a little enhanced these mysteries. Hence, although in Sterbeeck's *Theatrum Fungorum* (1675), the first published book entirely devoted to cryptogamic plants, there is an excellent account and many figures of fungi, it was not, and indeed could not be, until after that primary task of natural science initiated by Linnæus—the compilation of the 'System of Nature,' the orderly descriptive catalogue of natural things—had made considerable progress in almost all other directions, that its chapter dealing with the fungi was fully commenced. From about 1780 onwards we have illustrated cryptogamic floras essentially of the modern type, which not only soon reached tolerable completeness for the more obvious forms, but with the introduction and improvement of the microscope even made rapid progress with that description of the multifarious minor forms which is even now far from ended. It thus became known that some were produced from reproductive cells or spores, just like a plant from its seed; hence for this Linnean school, whose central monument is the works of Fries, each new form was, naturally enough, simply a new species to be described. The identification, however, of the fern and its prothallus (see FERNS) as phases of a single life-history, and the thorough reinterpretation of the higher cryptogams and their unification with the flowering plants thereupon effected by Hofmeister, naturally gave a fresh impetus to the study of the remaining lower groups of algæ and fungi. For fungi, this new movement was headed by Tulasne, who from 1851 onwards showed that many of the different form-species hitherto described were actually nothing more than the phases of a single protean life-history. Tulasne essentially relied upon the actual anatomical continuity of different adult forms, upon finding reproductive structures hitherto regarded as specifically distinct on one and the same vegetative body or mycelium; while De Bary confirmed and extended these results by the complementary method of cultivation from the spore. Tulasne's new doctrine of 'the pleomorphism of the fungi' aroused storms of controversy; but the bigoted conservatism of the systematists in the defence of their results, and the exaggerated speculation and practical blundering of the younger school in the reinterpretation of them, gradually subsided as the just claims of each obtained mutual recognition; and thanks to many workers, but especially to the exact labours of De Bary and his many pupils, the classification and morphology of fungi have thereafter been in harmonious progress.

It was long before any satisfactory definition of fungi was possible, their association with algæ (themselves scarcely better known) at first resting merely upon the negative characters which excluded both from the higher plants. Their physiological peculiarities, however, were more apparent; and their definition as a 'natural order' (or, as it gradually appeared, a vast class) was accepted as 'embracing all Thallophytes which do not vegetate by means of intrinsic chlorophyll.' The progress of research demonstrated the remote distinctness of some types of these from others, and the intimate relationship of certain fungi to particular algæ of which they seemed to be merely the colourless forms. Hence it was argued, especially by the physiologist Sachs, that such forms were no more entitled to separate classification apart from the algæ than were the very various types of flowering plants—e.g. dodder and broom-rape—which merely agree in having lost their chlorophyll through parasitism, apart from the ordinary green plants to which they are respectively akin. Abandoning, then, the physiology of the vegetative system, he proposed a classification of the algæ and fungi according to their degree of reproductive development (see ALGÆ). This was, however, going too far, and systematists have returned to the more conservative proposals of De Bary, who excludes entirely from the fungi the Bacteria (q.v.) and the Myxomycetes, and, while recognising that certain fungi are doubtless merely the colourless representatives of particular algal groups, yet vastly simplifies the subject by insisting upon 'an Ascomycetous series or main series of fungi,' albeit with more or less doubtfully related outlying forms.

At the outset of this great series are usually described two orders (sometimes united as Oomycetes), both closely related in vegetative and reproductive type to such simple algæ as Vaucheria (see ALGÆ). These are the Peronosporeæ, including such well-known moulds of living plants as *Phytophthora infestans* (see POTATO, p. 356), *Cystopus candidus* (White Rust of cruciferous plants), also Pythium and Peronospora. The allied Saprolegnia (see SALMON) gives its name to the other family.

Of the Zygomycetes the commonest type is *Mucor mucedo*, the common white mould of dead

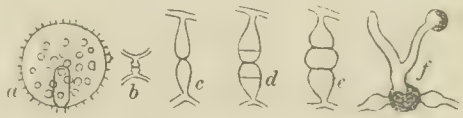


Fig. 1.—White Mould (*Mucor mucedo*):
a, ripe sporangium with few spores represented to show internal septum ingrown as columella; *b*, beginning of conjugation between two adjacent hyphæ; *c*, *d*, *e*, later stages of the process; *f*, germination of the thick-walled resting spore, with short vegetative and immediate reproductive hypha.

organic matter, particularly horse-dung, a form easily cultivated and in every way peculiarly suitable for beginning the study of fungology. Starting with a spore, this germinates into a filament or *hypha*, which remains unicellular like that of the preceding forms, and grows and branches rapidly through the nutrient material or solution, the whole growth of hyphæ being termed the *mycelium*. Soon erect hyphæ begin to bud from the older hyphæ of the mycelium; the tips of these enlarge into spherical heads, which become separated off as distinct cells, the future sporangium, by a partition which grows, however, inwards, into the interior of the enlarging spherical head, as the *columella*. The protoplasm of the sporangium is meantime dividing into a multitude of tiny cells, which surround themselves with cell-walls as spores, while the mineral waste products of this active change are deposited in the common sporangial wall, rendering it exceedingly brittle. This readily breaks, scattering the spores, which immediately recommence the same development.

Sooner or later, however, a more evolved process

of reproduction is needed, and two adjacent hyphæ conjugate much as in Spirogyra (see fig. 1, *b–e*, and Algæ, fig. 4). The resultant zygospore after a period of rest germinates with only a rudimentary mycelium, and immediately reproduces the characteristic asexual sporangium. Empusa, of which *E. musca* is largely fatal to house flies in autumn, is the type of the analogous order Entomophthoreæ. The Chytridiaceæ are an order of minute fungi of which the life-history is fundamentally similar to that of the Protococcaceæ among algæ.

The Ustilagineæ are a large family, parasitic on phanerogamous plants. Their mycelium ramifies through the intercellular spaces of the host, and forms also densely-woven masses of spore-bearing hyphæ, which show various degrees of differentiation as *compound sporophores*, so foreshadowing those of higher fungi. These spores produce a short mycelium, of which the branches conjugate in pairs, while the new mycelia thereafter arising re-enter the plant and in time produce new asexual spores. Some are formidable pests of agriculture (Ustilago, Tilletia).

Ascomycetes proper. The mycelium is always composed of multicellular hyphæ, which in the higher forms interweave into the stroma or thallus, which assumes various characteristic forms and bears the short reproductive hyphæ, which in turn bear the spore-mother cells or *asci*. These are usually tubular, and on reaching full size their protoplasm collects at the top, and the nucleus

Fig. 2.—Peziza: *a*, asci, with barren filaments (paraphyses); *b*, section of fructification surface (*hymenium*); *c*, preparations for the sexual process which precedes the development of the fungus-body; *d*, fertilisation, with upgrowth of an enveloping tissue, the incipient sporocarp.

Fig. 2*a*. Yeast (*Saccharomyces cerevisiæ*): *A*, *a*, *b*, *c*, *d*, early stages of budding; *e*, later stages. *B*, starved yeast cell, dividing at *a* to form four ascospores at *b*, *c*, subsequent germination on return to nutritive fluid.

divides repeatedly, usually producing eight nuclei, which collect protoplasm around them, and, developing cell-walls, become perfect *ascospores*. In all save a few of the lowest forms (Eremascus, Exoascus, &c., which are accordingly grouped as Gymnoasci) the fructification is in distinctly developed *sporocarps*. In these, besides the ascogenous hyphæ with their asci, there is an *envelope* derived from distinct hyphæ of the stroma, which also send in amongst the asci a multitude of barren filaments, the *paraphyses*. The aggregate of asci and paraphyses is termed the hymenium (see fig. 2, *a*, *b*). Tulasne and De Bary have shown with tolerable certainty (despite the doubts of Van Tieghem and Brefeld) that the whole fructification arises in consequence of a conjugation of similar hyphæ in the lowest forms (Eremascus), or the sexual union of dissimilar ones in higher forms (e.g. Peziza, fig. 2, *c*, *d*).

A brief systematic enumeration of the orders and leading illustrative forms of Ascomycetes will be found of service:

(1) *Gymnoasci.*—Asci not forming definite sporocarps with envelope (Eremascus, Exoascus).

(2) *Discomycetes* (800 species).—Sporocarp with envelope, but hymenium completely uncovered, at least at maturity. The most important genus is Peziza, of which the shallow cup-like sporocarp is open from the beginning, though in the allied Ascobolus the envelope encloses the hymenium during development and bursts, scattering the spores. Bulgaria resembles this, but is gelatinous. In Dermatia the cup is leathery or horny. In Stictis the hymenium is almost withdrawn into the stroma, while in Phacidium the sporocarp only breaks out and opens when ripe. In a second but less important family the sporocarps are leathery and black, elliptical, linear, or winding; of these Hysteria the commonest is *Rhytisma acerinum*, which forms the large black spots that appear upon almost every leaf of the common maple towards autumn. The Helvellacei represent an opposite type of development; the large sporocarps are stalked, with club or hat shaped hymenia, open and uncovered by the envelope from the beginning. Many are important as esculent, notably the morels (*Morchella esculenta, deliciosa*, &c.), also *Helvella esculenta*. The mycelium of *Rœsleria hypogæa*, found on dead and diseased vine-roots, is the 'pourridié de la vigne' of wine-growers.

Among the Discomycetes the life-history is often rendered more complex by the mycelium constricting off *acrospores* from the tips of erect filaments, these acrospores readily reproducing the mycelium. This stage of *Peziza Fuckeliana* was formerly known as *Botrytis cinerea;* and many other acrospore-bearing moulds still await similar identification. Vegetative hyphæ also frequently interweave into dense resting masses or *sclerotia*, as also in the species just named, and those may either redevelop acrospore-bearing hyphæ or (after a winter) give rise to true hymenial cups. Acrospores, too, may be developed either upon isolated hyphæ or in pseudo-hymenial groups, which may be open or flask-shaped (*pycnidia*). Nor are the many possibilities of 'pleomorphic' variation thus opened up by any means confined to the Discomycetes.

(3) *Pyrenomycetes.*—This is a large order of small and inconspicuous fungi, in all respects representing a further differentiation of the Discomycete type, primarily in the deepening of the shallow cup-shaped hymenium into a deep flask with minute apical opening (*perithecium*), but also in a more varied development—the most extreme among fungi—of pleomorphism or alternation of generations. The number of species is hence very uncertain. Besides the important Ergot (*Claviceps purpurea*, see Ergot), and its curious ally Cordyceps, which attacks caterpillars, moths, wasps, &c., with its fructification, thus forming the extraordinary 'animal-plants' and 'vegetating insects' which so perplexed the early naturalists, any of the common forms into which the old (and once all-comprehensive) genus Sphæria has been broken up will serve as type, conveniently Nectria, common in red patches upon dead wood. Some form parasitic patches within lichens.

(4) *Perisporiaceæ.*—In these the perithecia are completely closed capsules which fall to pieces on ripening; there are no paraphyses. The mycelium is thread-like, and acrospores are frequent. Of the 100 species some are notable pests, witness Erysiphe and others, commonly grouped as Mildew (q.v.), *Oidium Tuckeri*, a pestilent vine disease, &c. Easily distinguished by the dark or inconspicuous mycelium are the species of Fumago. To this group also belongs Eurotium, of which the common Bread Mould (*E. Aspergillus-glaucus*) is a type commonly put before the botanical student, from the comparative facility with which the sexual

process, which sets in after prolonged multiplication by acrospores, can be observed, with its resultant

Fig. 3.—Eurotium Aspergillus-glaucus:

a, a germination of spore in three phases; *a'*, head of reproductive hyphæ-bearing spores; *b*, *c*, appearance of conjugating filaments; *d*, *e*, growth of enveloping coat, complete in *f*, *g*, first appearance of asci (two buds); *h*, a ripe ascus; *i*, spores lying loose and ready to be set free.

development of the perithecium and its asci (see fig. 3).

(5) *Tuberacei.*—In this group, as in the preceding, the hymenium is permanently without external opening, but the chambers become narrow, coiled, and branched, and the whole complex sporocarp thus attains an extreme complexity. Most are subterranean, and are best represented by the important genus Tuber (see TRUFFLE). With this (or sometimes in the last group near Elaphomyces) is to be reckoned the very common mould of jam, bread, &c. (*Penicillium glaucum*); it rarely, however, attains full development beyond the acrospore-bearing form.

(6) *Lichenes.*—As the majority of lichen-forming fungi belong to the Ascomycetes, the lichens are very commonly now described under this head by recent writers. Yet not only the time-honoured distinctness of this group, but its remarkable variety and interest make separate treatment still expedient, hence see LICHENS.

Besides the large number of forms in which the existence of an acrosporous phase as yet rests upon analogy alone, De Bary reckons as 'doubtful Ascomycetes' such forms as Laboulbenia, Exoascus, and also the important species which excite alcoholic fermentations, Saccharomyces (fig. 2*a*). See YEAST, FERMENTATION.

From forms in which the characteristic mode of reproduction of the Ascomycetes is only doubtfully represented we readily pass to those in which it does not appear at all, but in which multiplication occurs only by acrospores or basidiospores, which may be of various forms. One group, however, we have to consider in which the sporocarp, here termed an *æcidium*, so closely resembles that of an Ascomycete as to induce De Bary and most writers to reckon it with these rather than with the following series.

(7) *The Uredineæ or Æcidiomycetes.*—These are the Rust fungi, a remarkable series of parasitic moulds, formerly associated with the Ustilagineæ, which they somewhat resemble in habit, but from which they differ in structure and life-history. The alternation of generations is remarkably complete and well differentiated, the different forms having constantly been reckoned in distinct genera, which are as yet by no means fully criticised. The most familiar case is that of the Rust of wheat (*Puccinia graminis*), in which the generation found on the barberry was described as *Æcidium berberidis*. Other important forms are known as *Uredo* sp. &c.; to this group is also reckoned the coffee disease of Ceylon, *Hemileia vastatrix*. The life-history of the group will be understood by reference to RUST.

BASIDIOMYCETES.—We now come to the Basidiomycetes proper, which derive their name from the *basidia* which segment off or 'abjoint' the spores (fig. 4, *d*). These are usually non-parasitic and have generally large and well-developed sporocarps; they are divided into two main groups.

A. HYMENOMYCETES.—Hymenium exposed upon the surface of the sporocarp.

(*a*) *Tremellini.*—Gelatinous with basidia each bearing only one spore, often arising laterally—Auricularia (Jew's Ear), Tremella (q.v.).

(*b*) *Hymenomycetes proper*, not gelatinous, two to six spores arising on each basidium (fig. 4, *a*—*d*).

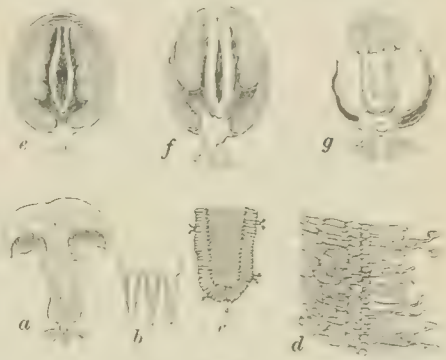


Fig. 4.

a, vertical section of an agaric (*Hymenomycetes*); *b*, section of three 'gills;' *c*, section of tip of gill, showing course of hyphæ-bearing basidia, of which five bear spores; *d*, portion more highly magnified; *e*, young Phallus (*Gasteromycetes*); *f*, the same at moment of rupture of peridium; *g*, more fully opened (the same figure on a smaller scale).

In the simplest forms the sporocarp is erect or branched, and bears a hymenium over its whole surface. Of this small group of (1) Clavarinei many species of Clavaria are common.

(2) In the allied Thelephorei the hymenium forms also a simple smooth surface, but is restricted either to the upper or under surface; in the latter case the fungus may be sessile or stalked, and have a distinct 'hat' or pileus (Thelephora, Stereum, &c.).

(3) In the Hydnei the hymenium becomes differentiated in various irregular and discontinuous forms, which may be warty, bristly, or comb-like.

(4) In the Polyporei the hymenium is continuous, but with many more or less tubular depressions. Here belong several important genera, notably Boletus (q.v.), Polyporus (see AMADOU), Fistulina (q.v.), as well as the pestilent *Merulius lachrymans* (Dry Rot, q.v.).

(5) In the immense group of Agaricini (1200 European species) the series culminates, the hymenium being arranged in regular radiating lamellæ or gills. Most important of course is the genus Agaricus and Mushroom (q.v.), which is broken up into many subgenera (Amanita, Armillaria, &c.). Cortinarius, Hygrophorus, Russula, Lactarius, Coprinus, Cantharellus (chantrelle), Marasmius are also important. Many of these are edible, others again poisonous.

B. GASTEROMYCETES.—Here the spores arise quite as in Basidiomycetes; but the hymenia are completely enclosed within the fungus-body. Of this the outer layer (*peridium*) becomes differentiated from the deeper substance (*gleba*). Both layers may undergo very remarkable histological and anatomical modifications, and these changes of ripening often result in the sudden acquirement of the most extraordinary forms. Hence, although the species are by no means so numerous (about 550), there are 70 genera. These are mostly large fungi,

often edible, at least in the young state; few are positively poisonous.

(1) Of the mostly subterranean and truffle-like Hymenogastrei, one genus, Gautieria, affords an interesting transition from the Hymenomycetes, its hymenial depressions remaining open and uncovered by any differentiated peridium. In the remaining types (Hymenogaster, &c.) the gleba contains many closed internal hymenial chambers, but remains continuous with the simple peridial coat.

(2) The Sclerodermei differ little from the preceding, save in the more differentiated peridium, from which the gleba dries away in a brittle network, lining the chambers, which become filled with spores. *Scleroderma vulgare* is sometimes used as an adulterant of truffles, but is commonly regarded as inedible.

(3) In the simplest Lycoperdinei or puff-balls the gleba may remain unchambered, but the tissue of the gleba usually breaks up into a woolly mass of dried hyphæ; hence the peridium when broken on ripening discloses a dusty mass of threads and spores (Lycoperdon, Bovista). See PUFF-BALL.

(4) In another series, the Phalloidei in the widest sense, we have a very singular series of forms. This begins with the simple earth-star (Geaster), which is essentially a puff-ball with outer and inner peridium, of which the outer opens into radiating lobes. In Batarrea, the gleba, covered with the inner peridium, becomes raised upon a long stalk; in Phallus (see fig. 4, *e*, *f*, *g*) the outer peridium, fibrous outside, becomes gelatinous within, while the stalk pushes the gleba through the inner peridium also, as a naked cap from which the spores drop away; while in Clathrus it is the inner peridium which expands as a large network.

(5) In the last series, that of Nidulariei, the external peridium opens, disclosing several separate 'peridioles,' each containing a hymenial tissue, which breaks down into a mass of spores. These are the 'bird's-nest fungi' (Cyathus, Nidularia, &c.). The origin of the Gasteromycete sporocarp from its mycelium appears to be without any sexual process, but by a process of direct growth and differentiation of an upgrowth upon its mycelium. In Hymenomycetes a sexual process has been sometimes described, but not with absolute certainty. We know, however, how constantly the abundant nutrition of an organism leads to the relapse from sexual to asexual multiplication.

As an appendix to this outline of classification, it is necessary to note that we not unfrequently find sterile mycelium forms, to which any definite systematic position frequently cannot be given. Such are, for instance, the well-known *Racodium cellare* of wine-cellars. There has been much dispute over the nature of the complex strands of Rhizomorpha, now regarded as belonging for the most part to *Agaricus melleus*, while the old genus Sclerotium has long been recognised as a resting state of many diverse forms—e.g. Ergot.

Germination.—Most spores are capable of immediate germination: such are most acrospores (*gonidia*), almost all acrospores, and most spores of Hymenomycetes. Some, however, require a period of rest: such are most oospores, zygospores, winter spores, &c. Although some spores perish almost immediately, many others exhibit considerable powers of resistance to heat, cold, drought, &c.; those of some moulds have been germinated from herbarium specimens three to ten years old. For germination we require a reasonable temperature, varying with the species, with supply of oxygen and moisture; nutritive matter may also be necessary. Many spores, however, have never as yet been observed to germinate at all, notably those of the truffle and some other Ascomycetes, of most Gasteromycetes, and of a few Hymenomycetes, including even the common mushroom.

Nutrition and Mode of Life.—The characteristic absence of chlorophyll renders the fungus unable to decompose carbonic anhydride. Hence it must depend upon organic compounds already formed. Almost any soluble carbon compound, not too poisonous or too fully oxidised (such as formic or oxalic acid, urea, &c.), will, however, serve for this, and similarly with most nitrogen compounds, even urea. The constituents of the ash can also be obtained from a wide range of substances. Penicillium grows best in a solution of proteid (peptone) and sugar, yet can be grown, of course with diminishing vigour, upon a whole series of poorer solutions, down to ammonium acetate. All of course give off carbonic acid in respiration, and a few are remarkably phosphorescent.

Such facts help us more clearly to understand the wide range of habitat presented not only by the different members of the group, but by the same species. Those fungi which normally obtain their organic matter from the dead organic matter of decaying bodies are termed *saprophytes*, while those which obtain them from living plants or animals are termed *parasites*. The former is doubtless to be regarded as the primary state of things, and includes the great majority of fungi, yet many normal saprophytes exhibit 'facultative parasitism,' and conversely normal parasites may exhibit 'facultative saprophytism.' Many saprophytes require a specific substratum—e.g. dung, feathers, &c.—just as many parasites have only a single host; others again have a very wide range of habitat. The chemical effects of the growth of fungi, with which, for physiological purposes, we may also reckon the Bacteria (q.v.), upon organic substances are outlined under FERMENTATION and PUTREFACTION. The relation of specific parasites to their hosts, besides mention in the various special articles, such as ERGOT, MILDEW, and RUST, is more generally treated under PLANTS (DISEASES OF) and PARASITIC PLANTS; the pathological bearings (the GERM THEORY) at GERM, and articles there cited. That remarkable adjustment of fungus and host which rises beyond the pathological level into the healthy and permanent mutual adaptation known as *Symbiosis* (q.v.) is described, for the association of fungus and alga, under LICHENS; that of fungus-mycelia with the roots of phanerogamous trees is the so-called Mycorhiza.

Uses of Fungi.—Of species used in medicine, the only one now of importance is Ergot (q.v.): the narcotic use of the Siberian fungus has also been described under AMANITA. Amadou (q.v.) and Moxa (q.v.) are old sources of tinder, and *Polyporus squamosus*, cut in slices, was much used for razor-strops. But the chief use of fungi is for food and in the manufacture of Ketchup (q.v.).

Although few fungi are used as food, and most popularly regarded as poisonous, the positively dangerous species are really by no means very numerous. Yet the risks of incautious gathering must not be understated, since not only are some edible fungi liable to be confounded with poisonous forms, but some normally wholesome forms acquire poisonous properties under particular circumstances, although whether this be due to definite variation or to the chemical changes of incipient decomposition remains doubtful. Hence our common mushroom is excluded from the Italian markets. There is no certain rule which can supersede the need of experience and caution in discriminating wholesome from unwholesome forms, the popular beliefs—e.g. that the latter only will discolour a silver spoon if stirred with it while being cooked, or that they are more readily deliquescent—being without foundation. Nor does colour or odour afford any certain

test, for, although most forms of gaudy exterior or readily changeable internal colour may be suspected, and all fetid ones of course avoided, some poisonous ones are quite inconspicuous and inoffensive. Again, some which are pungent and acrid while raw become bland and wholesome when cooked; maceration in vinegar or brine produces a similar effect.

The importance of fungi as an article of diet is naturally minimised in Britain through the prevailing ignorance and the consequent excessive distrust; in France, and especially in Italy, they are of much greater importance. The culture of the Mushroom has, however, of late years become increasingly frequent, while on the Continent that of a number of other species has long been practised with more or less success, as notably of Agaricus, Boletus, &c., and more recently of the truffle. The leading edible fungi have already been noted, and are also in most cases the subject of separate articles; it may suffice therefore here to bring together the most important. Besides the Mushroom, its immediate congeners, and its closer allies, such as the Chantrelle (*Cantharellus cibarius*), we have among the Hymenomycetes a number of species of Boletus and of Polyporus, also *Fistulina hepatica*, and several species of Lactarius, Hydnum, and Clavaria, with *Marasmius oreades*. Among Gasteromycetes, the puff-balls (Lycoperdon, Bovista), in the young state. Of Ascomycetes, the Morel, Helvella, with Verpa, some of Peziza, &c., and, of course, above all others, the Truffle. *Cyttaria Darwinii*, which grows on beeches in Tierra del Fuego, forms an important article of native diet.

Poisonous Effects and Treatment.—Noxious species may produce sometimes irritant, sometimes narcotic effects. The effects appear soon after the meal, and may be manifested by giddiness, dimness of sight, and debility. The person may seem intoxicated, and there may be singular illusions of sense, while even spasms and convulsions may appear in the most serious cases. In most cases, however, recovery takes place, especially if vomiting be early induced. Hence emetics should be administered as promptly as possible, and castor-oil also given freely.

For general accounts of fungi, see the leading textbooks of botany, notably Goebel's *Outlines of Classification* (Oxford, 1887), and those of Van Tieghem and Luerssen; or, very conveniently, Bennett and Murray's *Cryptogamic Botany* (Lond. 1889). The central work is De Bary's *Comp. Morphol. and Biol. of Fungi*, &c. (Eng. trans. Oxford, 1887). Systematic information must be sought in works such as Saccardo's *Sylloge Fungorum*, and the various cryptogamic floras, such as M. C. Cooke's *Handbook of British Fungi* (2d ed. 1887), his *Illustrations of British Fungi* (2d ed. 6 vols. 1884–88), or Stevenson's *Mycologia Scotica* and *Hymenomycetes Britannici*. Leunis, *Synopsis der Pflanzenkunde*, vol. iii., is also of service. For esculent fungi, see Badham, *Esculent Funguses of England* (1863); W. G. Smith, *Mushrooms and Toadstools* (1879).

Fungibles are movable effects which perish by being used, and which are estimated by weight, number, and measure, such as corn, wine, money. Things are fungible when their place can be adequately supplied by other individuals of the same class, as where a sum of money is repaid by means of other coins than those in which it was received. Thus, jewels, paintings, and works of art are not fungibles, because their value differs in each individual of the species without possessing any common standard.

Fungus (Lat., 'a mushroom') is a term applied in pathology and surgery to exuberant granulations or ulcerating tumour-growths when they project somewhat in the form of a mushroom above the surface of the skin or mucous membrane where they are situated. The conditions giving rise to this appearance occur especially in connection with the testicle and the brain. Tumours in which it occurs are frequently cancerous. The name also occurs in pathology in its true botanical sense; for Actinomycosis, Favus, Ringworm (q.v.), &c. are produced by parasitic fungi.

Fungus Melitensis. See CYNOMORIUM.

Funkia, so called after a Prussian botanist and herbalist (1771–1839), and sometimes known in English as Plantain-lilies, a genus of Liliaceæ allied to the day-lilies (Hemerocallis). Since their introduction from China in 1790, the five or six species have been largely and increasingly cultivated, not only in greenhouses, but in shrubberies and borders or rockwork, on account of the remarkable beauty of their masses of large broadly ovate or cordate, often variegated leaves. They are easily propagated by division of the tuberous crown, and thrive best in deep soil well manured.

Funny Bone is really the ulnar nerve, which is in most persons so little protected where it passes behind the internal condyle (the projection of the lower end of the humerus at the inner side) to the forearm, that it is often affected by blows on that part. The tingling sensation which is then felt to shoot down the forearm to the fingers has given rise to the name.

Fur. See FURS.

Fur is the term applied to the incrustation which is formed in the interior of vessels (teakettles, boilers of steam-engines, &c.) when calcareous water has been for a considerable time boiled in them. Many spring waters contain carbonate of lime held in solution by carbonic acid. When this water is boiled, the acid is expelled and the carbonate is deposited, often in association with a little sulphate, forming a lining more or less coherent upon the sides of the vessel. In steam-boilers this may be prevented by the addition of a small quantity of sal-ammoniac (ammonium chloride) to the water; carbonate of ammonia is formed and volatilised, while chloride of calcium remains in solution. This chloride, however, attacks the iron more or less according to its quantity and the other saline constituents of the water; therefore many substitutes are offered, some patented, some sold as secret preparations. The carcass of a pig that has died of disease has been found effectual. It appears to act by greasing the particles of carbonate of lime as they precipitate, and thus forming a loose and easily removable powder instead of a coherent deposit. Any other refuse fatty matter may be used for this purpose. The writer strongly recommends this simple mode of treatment, combined with frequent cleansing.

Furfuramide is closely related to FURFURINE and FURFUROL, and all three substances may be prepared from wood. When this is heated with water under pressure for some time, and the resulting liquor distilled, furfurol, $C_5H_4O_2$, an aromatic oil, with an odour resembling cinnamon and bitter almonds, is obtained. By treatment with ammonia this is converted into furfuramide, $C_{15}H_{12}N_2O_3$, a neutral crystalline body. By boiling this again with a solution of potash, furfurine, an alkaline base having the same composition as, and isomeric with, furfuramide is produced. These substances are of little industrial importance.

Furies. See EUMENIDES.

Furlong (i.e. a furrow long), a measure of length, the eighth part of a mile or 220 yards.

Furlough, a military term signifying temporary leave of absence from service. Non-commissioned officers and private soldiers on furlough must be provided with a pass, or they are liable to be seized and dealt with as deserters.

Furnaces. Furnaces perform one of the most important of functions, and on them largely depend the power and economical efficiency of the steam engine. Great care and skill, combined with an intimate knowledge of the laws which regulate combustion, must be exercised in the designing and construction of furnaces for steam-boilers. They may be considered as divided into three parts. (1) The fire-chamber, where combustion begins, the fuel is split up into its constituent gases, and the remainder consumed. (2) The combustion-chamber, where combustion of the gases is completed, and the heat applied. (3) The arrangements for the supply of air, and its mixture with the heated gases. In the combustion of fuel there are two leading conditions to be observed—viz. to obtain as complete combustion of the fuel with as little waste of heat as possible, and to apply as much of the heat as is practicable to those parts of the boiler where evaporation will be greatest. These two conditions are somewhat difficult to realise in a furnace, and, while the best method of applying heat is well known, the portion available out of a given quantity bears but a very small proportion to what is lost or wasted under the most favourable circumstances. The supply of air is a most important factor; too much has the effect of chilling and diluting the gases, reducing the temperature of the furnace, and diminishing the force of the draught; while too little causes the gases to escape unconsumed, and results in great waste. The proper supply of air is therefore a very difficult matter to accomplish, especially when there is an ever-varying demand for it, as is the case with solid fuel. Liquid or gaseous fuel does not present the same variation. It has

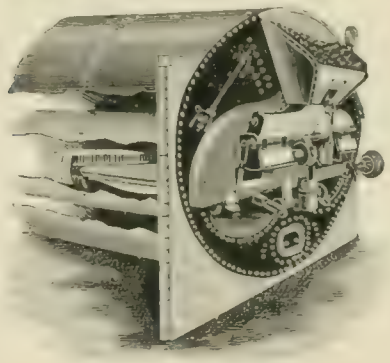


Fig. 1.

been found that the best effect is obtained from furnaces with forced draught—i.e. sending a steady flow of air under pressure through the incandescent fuel by means of a fan or other mechanical contrivance. With the ordinary chimney draught, the heated products of combustion must be allowed to escape at a high temperature, say 600°, and at a speed of about 30 feet per second, in order to maintain an effective draught. With artificial draught, the heat can be retained in the furnace a much longer time, and a balance established between the pressure of the atmosphere and the heat inside. Also the waste heat, instead of rushing away at great velocity, may be made to do work in heating the air for the furnace or the feed-water for the boiler; and is thus allowed to escape only when deprived of its power of doing useful work. The difference in efficiency is said to exceed 25 per cent. in favour of artificial draught.

A good furnace ought to be able to burn a large quantity of coal on a small area of fire-grate. The amount of fuel consumed in different kinds of furnaces varies greatly, and shows the power that forced draught gives. A land-boiler furnace burns about 14 lb. of coal, a marine furnace 16 to 24 lb., and a locomotive, with the draught increased by the escaping steam, from 80 to 200 lb. on the square foot of fire-grate in one hour. The great objects to be desired in furnace management are the exact apportionment of air to the varying wants of the fuel, so as to convert all the carbon to carbonic acid and the hydrogen to water, an equal and high temperature of the furnace, and that the grate-bars be always covered with fuel. Granted these conditions, and we obtain the best effect from the furnace, without smoke. Smoke may be caused by too much as well as too little air, especially with a low temperature in the furnace. Too much air reduces the heat of the furnace and gases below the temperature for combustion, and so smoke is formed. The same result comes from a deficient supply of air to take up all the carbon, a portion of which escapes as smoke. At the same time, with a *high* temperature in the furnace, insufficient air does not cause smoke; carbonic oxide instead of carbonic acid is formed, and one-half of the heat is wasted. In practice, deficient boiler power is a fertile cause of smoke, from having to urge the fire beyond its capacity. Self-feeding furnaces are more economical and efficient than those which are fed by hand. Fig. 1 shows one of the most successful. A large hopper fixed in front of the boiler contains a supply of fuel for a stated period, and requires no further attendance until its contents are consumed. There is an opening at the level of the grate, through which the coals are thrown on to the bars. It is claimed for this self-feeding furnace that it more nearly approaches in regularity firing by hand than any other in use, but there is no smoke when once in operation, and a saving of 10 per cent. in fuel. Figs. 2 and 3 show the best arrangement of flues. The flame on leaving the grate passes through the central tube, descends and returns along the bottom to the front, where it splits and passes on both sides to the chimney. For Blast-furnaces, &c., see GLASS, IRON, COPPER, LEAD, STEEL, REVERBERATORY FURNACE, ELECTRIC FURNACE; also BOILER, HEAT, OVEN, POTTERY, STEAM ENGINE.

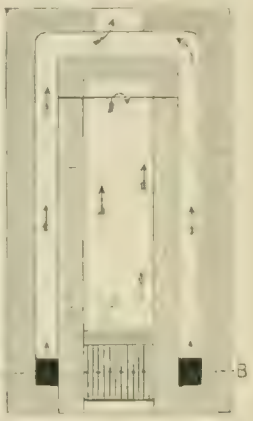


Fig. 2.—Plan of Furnace.

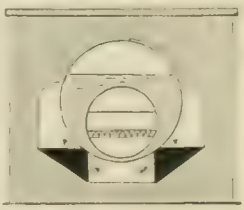


Fig. 3.
Section through AB, fig. 2.

Furneaux Islands, a group of barren islands in Bass Strait, between Australia and Tasmania, Flinders Island being the largest. About 300 people of mixed breed capture seals and sea-birds. Tobias Furneaux, one of Cook's captains, discovered the group in 1773.

Furnes, a town of Belgium, in West Flanders, 16 miles by rail E. by N. of Dunkirk, has tanneries and linen manufactures. Pop. 5322.

Furness, a district in the north-west of Lancashire, forming a peninsula between Morecambe Bay and the Irish Sea. The chief town is Barrow-in-Furness (q.v.). The ruin of Furness Abbey, 2 miles from Barrow, is one of the finest examples of the transition Norman and Early English architecture in the country. Founded in 1127 for the Benedictines, it afterwards became a Cistercian house. It was long one of the wealthiest abbeys in the kingdom. The civil jurisdiction of the princely abbots of Furness extended beyond the district of Furness. See Richardson's *Furness* (1880), and Barber's *Furness and Cartmel Notes* (1895).

Furnivall, Frederick James, a laborious and enthusiastic student of early English, was born at Egham in Surrey, February 4, 1825, and educated at private schools, University College, London, and Trinity Hall, Cambridge, where he graduated B.A. in 1846, M.A. in 1849. He was called to the Bar in 1849. In early life he associated himself in philanthropic work with Frederick Maurice, &c., taught in the Working Men's College every term for ten years, and was for the same period a captain in its rifle corps. He has devoted himself to English philology, and with characteristic energy has succeeded in founding, for the publication of texts, 'The Early English Text Society,' 1864 (with the 'Extra Series,' 1867); 'The Chaucer Society' (1868); 'The Ballad Society' (1868); the 'New Shakspere Society' (1874); 'The Browning Society' (1881, with Miss Hickey); 'The Wyclif Society' (1882); and 'The Shelley Society' (1886). He has been honorary secretary of the Philological Society since 1854, while he edited for some years the Society's great English Dictionary, the first part of which saw the light under the supervision of Dr Murray in 1884. Through these societies he has raised and expended upwards of £30,000 in printing early MSS. and rare books, and has thus placed in the hands of thousands of students cheap and accurate texts, some score of these well edited by himself. His Robert of Brunne's *Handlyng Synne* and *Chronicle* were edited for the Roxburghe Club and Rolls Series. His most valuable work, however, has been his splendid edition of Chaucer's *Canterbury Tales:* 'A Six-text Print of Chaucer's Canterbury Tales' (7 parts, 1868–75), being an exact print (with the Tales in their proper order and groups) of six of the seven most important MSS.; the seventh he has since printed by itself, besides all the MSS. of Chaucer's Minor Poems. This work has given a new impulse to early English scholarship, and will always remain a monument of the noble and patient enthusiasm of its editor. For the New Shakspere Society he has edited several books of worth in its 'Shakspere's England Series,' specially Harrison's *Description of England* (1577–87) and Stubbes's *Anatomy of Abuses in England* (1583). Of his introduction to the Leopold *Shakspere*, describing the plays and poems in chronological order, over 100,000 copies have been sold. He and a friend built the first narrow wagerboat in England in 1845, and he first introduced sculling fours and eights in 1884 and 1885, and was in the winning crews of the first races ever sculled in these boats. Furnivall was granted in 1884 a Civil List pension of £150. On his sixtieth birthday the university of Berlin conferred on him its honorary Ph.D. In 1881 he prepared a bibliography of Browning; and in 1888 he edited, with his medical son Percy, the first English book on anatomy (by Vicary, 1548). Forty-three fac-similes of the quartos of Shakspere's Plays were edited by Furnivall and other scholars. In 1892–97 he edited two volumes of Hoccleve. In 1900–1901 there was a presentation to him and other courtesies, in honour of his seventy-fifth birthday.

Furnival's Inn. See Inns of Court.

Furruckabad. See Farukhabad.

Furs. Under the name of furs may be included the skins of almost all those animals which, for the sake of protection against cold, have for a covering an under layer of a soft, woolly or downy texture, through which grows in most instances an upper one of a more bristly or hairy nature; some by nature possess more of the under coat, and others more of the upper, the proportion varying considerably in different animals and countries. In winter the fur becomes thicker in its growth, thereby improving the quality and value for commercial purposes; young animals too possess thicker coats than full-grown ones. In some instances the underfur alone is used in manufacturing, whilst the upper hairs are removed—e.g. in the fur-seal.

The more general use of furs in all civilised countries has made the fur-trade of the present day of even greater importance than in those flourishing days when the fur-traders were the chief pioneers of the North American continent: the quantities of many fur-bearing animals have vastly increased, especially of those rather small mammals which seem to thrive and breed quickly in the proximity of settlements; the larger ones, on the other hand, such as bears, beavers, &c., will in course of time, if not protected, become generally reduced in numbers, a fate which seems to have overtaken the buffalo or North American bison.

The chief supply of furs is obtained from Siberia and the northern parts of North America, and, as these tracts are for the greater part of the year frostbound, the fur-bearing animals enjoy a comparatively unmolested life; the fur, therefore, grows thickly during the winter season, and is in its best condition when the animal is trapped in the spring; large quantities also of the smaller sorts are found in the United States; Europe produces immense numbers of common furs, such as rabbits, hares, foxes, &c., besides the more valuable stone and baum (tree) martens, though the larger animals have almost disappeared as the countries have become more and more cleared and inhabited; South America yields nutrias and chinchillas; whilst Australia exports rabbits, opossums, and kangaroos, and Africa monkey and leopard skins. Nearly all fur-skins are brought to the market in the raw or undressed state.

The two leading companies are the Hudson Bay Company (q.v.), established in 1670, and the North American Fur-sealing Company since 1890; the Fur Company of New York, the North-west Company, and the Russo-American Company of Moscow once held important positions, but they have long since been broken up or amalgamated. The Skinners' Company of London, one of the city companies or guilds, formerly possessed many ancient privileges and rights in connection with the fur-trade, but these are now in abeyance. The collections of furs of the two first-named companies, together with large quantities consigned from numerous private traders, are annually offered in London for public auction in January and March, with a smaller sale in June; periodical sales during the year are held besides of Australian, African, and other fur-skins. Many important fairs take place on the Continent and in Asia, of which the chief are at Leipzig in Germany (at Easter and Michaelmas), Nijni Novgorod and Irbit in Russia, and smaller ones at Frankfort (Germany), Ishim and Kiakhta (both in Siberia).

Following is a list of the principal fur-producing animals, with a few of the most interesting and important facts in connection with them with regard to the fur-trade; the values are those for the raw skins in the years 1890–95:

Badger (*Taxidea americana*).—The fine haired kind, used for fur purposes, comes from North America—value, 6d. to 22s.; whilst the coarse bristly haired skins (*Meles taxus*), utilised for brushes, are imported from Russia, Bosnia, and Bulgaria; value, 2s. to 2s. 6d.

Black Bear (*Ursus americanus*) yields the well-known fur which is seen on the headgear of the Guards; also much esteemed as a general fur, as it is long, black, glossy, and thick. About 14,000 skins are imported annually from Canada, Alaska, and part of the United States, values ranging from 2s. for very common to as much as £14 for best. The Brown or Isabella Bear is a variety of the above, the value considerably higher, and quantity imported much less. The Russian Bear (*Ursus arctos*), the Grizzly Bear (*U. horribilis*) from North America, and the white Polar Bear (*U. maritimus*) from the Arctic regions likewise possess skins of considerable value.

Beaver (*Castor canadensis*) has a rich brown fur, but is more generally known in its 'plucked' or 'unhaired' state (with the long hairs removed); the most valuable are quite black in colour; the fur has besides a good appearance when dyed. In former times beaver fur was used in the manufacture of hats, but is now almost superseded by silk. Exported from North America in quantities of about 150,000 skins annually. Value, from 6s. to 60s., according to quality.

Chinchilla (*Chinchilla lanigera*).—'Real' chinchilla is the finest and most delicate of all furs, extremely soft to the touch, and the colour bluish-gray; the best come from Peru, a good skin being worth 40s. 'Bastard' chinchillas are less valuable, and only worth from 6d. to 2s. apiece.

Ermine (*Mustela erminea*).—Colour of fur white (in its winter coat), with the exception of the tip of the tail, which is black. The animal is widely distributed; the chief supplies from Siberia. The fur is no longer restricted to royalty as in olden times. Value, about 1s. Miniver is ermine fur with black spots of lamb-skin sewn in.

Fisher or Pekan (*Martes pennanti*).—A North American fur; value, 13s. to 70s. Used almost exclusively by the Russians.

Fitch or Polecat (*Mustela putorius*), from Germany, Holland, and Denmark. Used in England for civic robes. Value, 2s. to 5s.

Blue Fox (*Vulpes lagopus*).—Colour, a more or less brownish-blue, or deep slate at its best. About 3000 skins are imported annually from North America. Value, 45s. to 200s.

Cross Fox (*Canis fulvus*).—Similar to the silver fox, but redder in hue, and there is generally a darker shade of colour across the shoulders, forming a sort of cross, whence the name is derived. This fur too is mostly worn in Russia. Yearly collection about 7000; prices, from 9s. to 111s.

Gray Fox (*C. virginianus*), Kitt Fox (*C. velox*).—Both of a grayish colour, and from North America, the former from the United States; value, 11d. to 4s. 9d., and importation 30,000. Value of the kitt fox about 2s.

Red Fox (*C. fulvus*).—General hue, of a sandy red, although a few from Minnesota are quite light in colour, almost white, others again from Kamchatka are of a brilliant red. Chiefly worn as a fur in Turkey and eastern countries of Europe; about 60,000 to 80,000 skins are collected annually in North America and Kamchatka; prices range from 3s. to 30s. Some 100,000 of a similar but less valuable variety are caught in Europe.

Silver Fox (*C. fulvus*), the rarest of the three varieties of the American fox (in some districts red, cross, and silver foxes are found in the same litter), is principally obtained from Alaska, Columbia, and the Hudson Bay Territory. The colour is silvery black, occasionally brownish, the tip of the tail always white; a perfectly black skin (sometimes termed Black Fox) will fetch up to £170, a silvery one from £11 to £20. The majority are bought by Russia, the annual importation into London being only about 2000 skins.

White Fox (*Vulpes lagopus*) is in natural history the same animal as the Blue Fox, and likewise an expensive fur; a pure white is its finest colour; the discoloured are used for dyeing black, brown, silvery black, and slate blue, the last two in imitation of silver and blue-fox fur. Value, undyed, 4s. to 34s. Quantity annually imported, 6000 to 17,000.

Hare (*Lepus europæus*).—The ordinary gray are from all parts of Europe and largely used for felting purposes; in high latitudes the fur becomes a pure white in winter-time, and a large quantity of this sort is exported from Russia, some of which are dyed to imitate other more valuable furs.

Koala or Australian Bear (*Phascolarctus cinereus*), a common woolly fur, used for rugs, &c.

Kolinsky (*Mustela sibiricus*), a species of marten from Siberia, the tails of which are very valuable for artists' brushes (known as red sable). The colour of the fur is light yellow.

Lambs (*Ovis aries*).—Persian lamb, naturally black, but dyed the same colour to hide the white leather underneath, is worn by ladies and on gentlemen's coat collars, and often wrongly termed Astrakhan, which is a greatly inferior sort of lamb, chiefly worn in Canada, worth only from 1s. to 2s. 6d., whereas a Persian lamb fetches from 7s. to 22s. when dyed. The collection of the latter is about 200,000, and is imported from Persia; the Astrakhan is from Astrakhan in Russia; a similar skin to the Persian lamb, though commoner, is called Shiraz, from Shiraz in South Persia; Bokharens come from Bokhara, Ukrainer lambs from the Ukraine district, and gray Crimmers from the Crimea. Large numbers of white lambs from western Europe and Buenos Ayres are used for glove and boot linings; the white Iceland lamb as a children's fur.

Leopards (*Felis pardus*) are imported from Africa and India for rugs, &c. (value, 10s. to 35s.); tigers too from India (a good skin worth about £4); more valuable and thicker furred varieties of both animals are found in China, values about £7 to £12 and £10 to £60 respectively.

Lynx (*F. canadensis*).—The fur is of a light-brown colour, with a light silvery top on the back, that on the under part, long, soft, and spotted; about 30,000 to 80,000 are imported yearly from the Dominion of Canada, California, and Alaska. Both the annual importation and market price fluctuate considerably. Value, from 10s. to 34s.

Marten (*Martes americanus*).—A good and old-fashioned fur, now slowly recovering its value. The general colour is a rich brown, some skins nearly black, others again quite pale; the fur is light and soft, and generally considered one of the best for wear, appearance, price, and durability; the tails are bushy and much used for muffs, &c., a few utilised for fine artists' brushes. About 100,000 are trapped in North America, the finest in Labrador, East Maine, &c. Prices vary from 6s. to 70s. for very choice; an average price is about 20s. to 30s. Large quantities of Stone Martens (*Mustela foina*) and Baum or Pine Martens (*M. Martes*) are collected in Europe.

Mink (*Mustela Vison*), a water animal inhabiting Canada, the United States, and Alaska; its fur is brown and short, though quite dark in colour and fine in some districts, such as Labrador, Nova Scotia, &c., but light brown and coarse in others. Annual importation, about 300,000 to 400,000; value, from 1s. to 26s. for very prime.

Black Monkey (*Colobus vellerosus*) possesses a long, black, silky fur, its present value being from 3s. to 10s., a fairly high price compared with its usual worth. About 50,000 to 100,000 are imported every year from the west coast of Africa. The Gray Monkey (*Cercopithecus diana*) and a few others come as well from Africa.

Musk-rat or Musquash (*Fiber zibethicus*), a North American fur, about three millions of which are imported yearly, and used in nearly all countries, either 'natural' or 'plucked' and dyed, when it makes a common imitation of seal. The fur was formerly used for felting purposes. A black variety found in Delaware is also used as a fur, but in smaller quantities. Value of former, 6d. to 1s. 9d.

Nutria or Coypu Rat (*Myopotamus coypus*), from South America; the fur, when 'unhaired,' forms a cheap substitute for beaver. Value, 8d. to 1s. 9d.

Australian Opossum (*Phalangista vulpina*), a fur much in vogue on account of its cheapness and bluish-gray natural tint; many are manufactured when dyed various shades. Some 2,000,000 are imported every year. Price from 6d. to 2s. 3d.

American Opossum (*Didelphys virginiana*), an entirely different fur from the foregoing, with longer upper hairs of a silver-gray colour. Importation, 200,000 to 300,000; value 1d. to 2s. 5d.

Sea Otter (*Enhydra Lutris*), so abundant some years ago, has now sadly diminished in numbers owing to indiscriminate slaughter in former years, only a thousand or two being now taken annually at or near the Aleutian Islands. Its skin brings the highest individual price of all furs, and even as much as £225 has been paid for a single skin; ordinary values are from £20 to £70. The fur is dense, rich, rather long, and fine, of a dark-brown colour, the most highly valued skins possessing silvery hairs. Chiefly worn in Russia.

Otter (*Lutra canadensis*) is characterised by the stoutness and density of its fur, which is somewhat short like seal; used in most countries either in the natural state or 'unhaired,' and sometimes dyed. The general colour is from light to dark brown or almost black; the finest skins come from Nova Scotia and Labrador; about 16,000 are imported annually from North America, though otters are found nearly all over the world. Prices range from 9s. to 95s. for best.

Rabbit (*Lepus cuniculus*), from its vast quantities (probably about ten to twenty million skins are used annually), is the most widely known fur in all countries, in all shapes and forms, both 'natural' and dyed; when clipped and dyed it forms an inferior imitation of fur-seal. The greater portion of the Australian importation (about 6000 bales, containing each about 200 dozen) is used for felting in the manufacture of hats, &c.; the fur when cut off for this purpose is termed 'coney-wool.'

Raccoon (*Procyon lotor*) yields a serviceable fur; price from 1s. 6d. to 7s. per skin, the best dark coloured from 10s. to 20s. The colour is gray or dark gray, often with a brownish-yellow tinge; the fur is widely used in both 'natural' and dyed states. About 400,000 to 500,000 skins are yearly imported from the United States.

Russian Sable (*Mustela zibellina*), the most costly of all furs, considering the small size of the skin; the quality extremely fine. The darkest are the most valuable; the usual colour an umber brown and less red than marten fur. Some of the finest Yakutsk skins have realised up to £45 apiece (wholesale price), but a more ordinary value is from 40s. to 90s. About 5000 to 6000 are sold every year in London, of which many come from Kamchatka and Okhotsk.

Fur-seal (*Callorhinus ursinus*).—The chief supply of the Alaska seal is from the Pribylov Islands in the Behring Sea, and the take is now regulated by a treaty of 1894 between Britain and the United States, which, after years of acrid disputing, settled a close time and the number of seals to be taken by either party to the arrangement. Japan and the adjacent seas produce fur-seals; many are also taken at Cape Horn and Lobos Island, but the former great fisheries in the South Seas are nearly exhausted; the Antarctic skins (of which 834 came to London in 1892, 45 in 1893, and none in 1894) are still reckoned the best (see SEAL). In the salted state they are very unsightly and dirty; the first process in their preparation, which is almost entirely carried on in London, is 'blubbering' (removing superfluous fat, &c.), and the subsequent ones, washing, 'unhairing' (i.e. removing the long, coarse, or 'water' hairs), leathering, dyeing, shaving the pelt, and machining, which last takes away all trace of the 'water' hairs, leaving the soft velvety under-fur so well known and justly appreciated.

Various other seals, such as the Common Seal (*Phoca vitulina*), Greenland Seal (*P. groenlandica*), Fetid Seal (*P. fetida*), and Hooded Seal (*Cystophora cristata*), though chiefly caught for the sake of their oil and hides, are made use of in the fur-trade, under the names of Spotted Hair Seals, Bluebacks, and Whitecoats, the two last named when dyed. The Greenland, Fetid, and Hooded seals are taken in large numbers by the Dundee whalers on the ice-floes near Greenland and Newfoundland, and it has been a common delusion that these are fur-seals, which are, however, generally killed on land.

Skunk (*Mephitis mephiticus*) has greatly increased as an article of commerce in the trade since 1880, whereas forty years before it was hardly known to fur-traders, being considered of little or no value from the great drawback in its powerful odour, but this has now to a great extent been overcome. The colour varies from almost white to a rich black, according as the two white stripes are more or less pronounced. About 500,000 to 600,000 skins are trapped in the central parts of the United States, a small quantity in the Dominion of Canada. Value, 6d. to 11s. 6d.

Squirrel (*Sciurus vulgaris*).—About three millions are collected yearly in Siberia and in part of Russia in Europe; the chief trade for dressing the skins and making them into the well-known cloak linings is at Weissenfels in Germany. The tails fetch an enormous price for making into boas; a few too are used for artists' brushes. Values vary from a few pence to about 1s., though the skins are sold in the trade by the hundred.

Wolf.—The finest and largest (*Canis lupus occidentalis*) come from Labrador and the Churchill district; the colour of these is sometimes white or blue, besides the ordinary grizzled colour. Value, 7s. 6d. to 105s., and much esteemed for sleigh robes. A smaller species, the Prairie Wolf (*C. latrans*), is found in larger quantities in the United States; worth only 4s. 6d. to 8s. A large number of the large, coarse Russian Wolf (*C. lupus*) are used as well in the fur-trade.

Wolverine (*Gulo luscus*), a good fur, from Canada, Alaska, and Siberia, of a rather long, coarse description, with a large more or less deep brown 'saddle' mark on its back in the centre of a paler band, with deep brown again beyond. Value, 8s. 6d. to 36s.; quantity annually imported, about 3000.

The usual mode of dressing furs is by steeping them in liquor for a short time, after which the pelts are 'fleshed' over a sharp knife (to get rid of the excess of fat, &c.), and subsequently dried off; they are next trodden by the feet in tubs of warm

sawdust and common butter, by which means the pelt or leather is rendered supple; the skin is finished in dry sawdust, and beaten out.

Certain furs, such as beaver (now to a limited extent), nutria, hare, and rabbit, are used in the manufacture of hats and other felted fabrics, for which purposes the under-fur alone is retained; it is cut off from the pelt, separated from the upper hair, and felted together by means of various machinery (see HAT).

Fürst. See PRINCE.

Fürst, JULIUS, German Orientalist, was born of Jewish parentage, 12th May 1805, at Zerkowo, in Posen. Educated on the strictly orthodox rabbinical and Hebrew literature, he felt constrained, on proceeding to Berlin to study oriental languages and theology in 1825, to discard the intellectual pabulum of his fathers for the more stimulating results of modern scientific investigation. In 1833 he settled as *privat docent* at Leipzig, and in 1864 became professor of the Aramaic and Talmudic Languages, a post he held down to his death on 9th February 1873. Among his numerous and useful writings may be mentioned *Lehrgebäude der Aramäischen Idiome* (1835); a praiseworthy edition of Buxtorf's Hebrew and Chaldee Concordance (1837–40); *Die Jüdischen Religions-philosophen des Mittelalters* (1845); *Geschichte der Juden in Asien* (1849); *Bibliotheca Judaica* (1849–63); *Hebräisches und Chaldäisches Handwörterbuch* (1851–54; translated by Dr S. Davidson, 5th ed. 1885); and *Geschichte der Biblischen Literatur und des Jüdisch-Hellenischen Schriftthums* (1867–70).

Fürstenwalde, a town of Prussia, on the Spree, 30 miles SE. of Berlin. There are important breweries, a large malting-house, &c. Pop. (1875) 9688; (1890) 12,934.

Fürth, a manufacturing town of Bavaria, is situated at the confluence of the Rednitz and the Pegnitz, 5 miles NW. of Nuremberg by the earliest German railway (1835). It is famous for its mirrors, bronze colours, tinsel, lead pencils, combs, optical instruments, metal toys, wares of beaten gold, silver, and other leaf-metal, turnery wares, furniture, stationery, and chicory. The town has also some large breweries, and an extensive foreign trade. Pop. (1875) 27,360; (1890) 43,206, of whom 8715 were Catholics and 3175 Jews. The town was burned to the ground in 1634 and 1680. It fell to Bavaria in 1806.

Fury and Hecla Strait, in 70° N. lat., separates Melville Peninsula from Cockburn Island, and connects Fox Channel with the Gulf of Boothia. It was discovered by Parry in 1822, and named after his ships.

Furze (*Ulex*), a European genus of very branched and thorny shrubs, with linear sharply-pointed leaves, solitary flowers, and two-lipped calyx, belonging to the order Leguminosæ, sub-order Papilionaceæ. The Common Furze (*U. europæus*), also called Whin and Gorse, is common in many of the southern parts of Europe and in Britain, although not reaching any considerable elevation, and often suffering from the frost of severe winters; whereas in mild seasons its flowers may be seen all winter, hence the old proverb, 'Love is out of season when the furze is out of blossom.' It is hence scarcely known in any of the northern parts of the Continent; and Linnæus is said to have burst into exclamations of grateful rapture when he first saw Wimbledon Common covered with furze bushes glowing in the profusion of their rich golden flowers. Furze is sometimes planted for hedges, but occupies great breadth of ground without readily acquiring sufficient strength; nor is it thickened by cutting. It affords a wholesome fodder, especially when young, or when its thorns are artificially bruised;

Fig. 1.—Common Furze (*Ulex europæus*).

it is also useful for sheep in winter, and on this account is burned down to the ground by sheep-farmers when its stems become too high and woody, so that a supply of green succulent shoots may be secured. Furze is also esteemed as a cover for rabbits, foxes, &c. A double-flowering variety is common in gardens. A very beautiful variety called Irish Furze (*U. strictus* of some botanists) is remarkable for its dense, compact, and erect branches; the Dwarf Furze (*U. nanus*) is perhaps also a mere variety.

The seedling whin is of interest as bearing two or more ternate leaves just after the cotyledons. These are followed by simple leaves, as in a shoot of broom, and thereafter the characteristic spiny leaves and branches soon begin to appear (see fig. 2, and compare those of seedlings in ACACIA).

Fig. 2.
Seedling Furze: *a*, cotyledons; *b*, first pair of leaves, ternate; *c*, succeeding leaves, simple.

Fusan or PUSAN, a port of Corea, on the SE. shore of the peninsula, came from the 16th century onwards more and more under Japanese influence. In 1876 it was formally opened to Japanese trade, and soon after to all nations. At the outbreak of the war between Japan and China (1894–95) the bulk of the population (6000) were Japanese, who still (though Russian influence begins to tell) have the trade in their hands. The imports (chiefly Manchester goods, salt, and Japanese wares) have an annual value of over 1,000,000 dollars; the exports (rice, beans, hides, &c.), of 1,300,000 dollars.

Fusaro, LAKE OF, a small lake of Italy, 11 miles W. from Naples, called by the Romans *Acherusia Palus;* it is near the site of the ancient Cumæ, and during the Roman empire its banks were studded with villas. Numerous remains of massive buildings, houses, and tombs are still to be seen in the neighbourhood. The water of the lake is brackish. Oysters have been cultivated here since the time of the Romans.

Fuse, Fusee. See FUZE.

Fusel or **Fousel Oil,** known also as POTATO SPIRIT, is a frequent impurity in spirits distilled from fermented potatoes, barley, rye, &c., to which it communicates a peculiar and offensive odour and taste, and an unwholesome property. Being less volatile than either alcohol or water, it accumulates in the last portions of the distilled liquor. It is principally formed in the fermentation of alkaline or neutral liquids, but does not occur in acidulous fermenting fluids which contain tartaric, racemic, or citric acid. It mainly consists of a substance to which chemists have given the name of amylic alcohol, whose composition is represented by the formula $C_5H_{12}O$. It is a colourless limpid fluid, which has a persistent and oppressive odour and a burning taste. It is only sparingly soluble in water, but may be mixed with alcohol, ether, and the essential oils in all proportions. Any whisky which produces a milky appearance, when mixed with four or five times its volume of water, may be suspected to contain it. Fusel oil is used for making pear-essence (amylic acetate—for the so-called 'pear-drops'), essential oils, and patent varnishes, and as a solvent for barks. See ALCOHOL, WHISKY.

Fu'seli, HENRY, or more properly Johann Heinrich Füssli, a portrait-painter and art-critic, was born at Zurich, 7th February 1742. In the course of a visit to England he became acquainted in 1767 with Sir Joshua Reynolds, who encouraged him to devote himself to painting. Accordingly he proceeded to Italy in 1770, where he remained for eight years, studying in particular the works of Michael Angelo, and enjoying the society of Winckelmann and Mengs. After his return to England he was elected in 1790 a member of the Royal Academy, where, nine years later, he became professor of Painting. He died at Putney, near London, 16th April 1825. His paintings, some 200 in number, include 'The Nightmare' (1781), and two series to illustrate Shakespeare's and Milton's works respectively. As a painter Fuseli was bold in conception, his imagination reaching up to the loftiest levels of ideal invention; his figures were full of life and energy; and his pictures were often wrought under the poetic inspiration of the mystery of the supernatural. They are, however, too frequently deficient in careful workmanship, the execution having been hurried and rash. His *Lectures on Painters* (1820) contain some of the best art-criticism in the English language. His literary works, with a narrative of his life, were published by Knowles (3 vols. Lond. 1831).

Fusible Metal, an alloy which melts at a temperature below that of boiling water. It consists of a mixture of several metals, of which bismuth is the most important. The following are examples:

Composition.	Melts at
4 bismuth, 2 lead, 1 tin, and 1 cadmium	60·5° C. (141 F.).
5 bismuth, 3 lead, and 1 tin	91·6° C. (197° F.).
8 bismuth, 5 lead, and 3 tin	94·5° C. (202 F.).

Both on account of its melting at a low temperature and of its property of expanding as it cools, fusible metal is valuable for several purposes in the arts. It is used in stereotyping, in taking casts of medals and of woodcuts, and in testing the finish of dies. It has also been employed for making anatomical casts, and a peculiar kind of it was used for making safety-plugs for steam-boilers. For the latter purpose it melts when the pressure of the steam becomes dangerously high. It was found, however, that the alloy underwent some change, by being kept long heated to near its melting-point, which rendered it unsuitable.

Fusiliers were formerly soldiers armed with a lighter fusil or musket than the rest of the army; but at present all regiments of foot carry the same pattern of rifle. Fusilier is therefore simply an historical title borne by a few regiments of the British army—viz. the Northumberland, Royal, Lancashire, Royal Scots, Royal Welsh, Royal Inniskilling, Royal Irish, Royal Munster, Royal Dublin, besides regiments in the native army of British India.

Fusion, Fusibility. See MELTING-POINT.

Fusiyama (properly *Fuji-san*), a sacred volcano, the loftiest mountain of Japan, stands on the main island, about 60 miles SW. of Tokio, and rises some 12,400 feet above sea-level, with a crater 500 feet deep. Its last eruption was in 1707. The cone is free from snow only in July—September, when thousands of white-robed Buddhist pilgrims make the ascent easily enough.

Fust, JOHANN, with Gutenberg and Schöffer formed the so-called 'Grand Typographical Triumvirate' at Mainz between 1450 and 1466. Dr Faust (q.v.) has sometimes been confounded with him. See PRINTING.

Fustel de Coulanges, NUMA DENIS, was born at Paris 18th March 1830, and after filling chairs successively at Amiens, Paris, and Strasburg, was transferred in 1875 to the École Normale at Paris, and became a member of the Institute in the same year. He died September 12, 1889. His earlier writings, *Mémoire sur l'île de Chio* (1857) and *Polybe, ou la Grèce conquise par les Romains* (1858), had hardly prepared the reading public for the altogether exceptional importance of his brilliant book *La Cité antique* (1864; 10th ed. 1885), which threw a flood of fresh light on the social and religious institutions of antiquity. The work was crowned by the French Academy, as was also his profoundly learned and luminous *Histoire des Institutions politiques de l'ancienne France* (vol. i. 1875).

Fustian is a name given to certain kinds of heavy cotton fabrics, including moleskin, velveret, velveteen, beaverteen, corduroy, and other varieties. They are chiefly used for men's apparel, and are nearly all of the nature of velvet, but in the case of corduroy the loops forming the pile are uncut. Fustian cloth with a velvet pile is first woven on the loom, after which the surface weft threads are successively cut, brushed, or teazled, and singed on a hot iron cylinder. The cloth is then bleached and dyed. According to the particular kind of fustian, the face is cropped or shorn either before or after it is dyed. See VELVET.

Fustic. The dyestuff sometimes termed *Old Fustic* is the wood of *Maclura tinctoria*, but the tree is also called *Morus tinctoria*. It is a native of Brazil, Mexico, and the West Indies. Formerly this dye-wood or its extract was largely used for dyeing wool yellow, or for the yellow portion of compound colours, but, like most other vegetable dyes, its importance has declined owing to the preference now given to coal-tar colours. The name *Young Fustic* is occasionally given to the wood of *Rhus cotinus*, the twigs and leaves of which yield a yellow dye, but are much more extensively used as a tanning material. See SUMACH, DYEING.

Fusus, or SPINDLE-SHELL, a genus of Gasteropods, usually referred to the Murex family. The elevated spire, the large last whorl, the canal for the respiratory siphon, are familiar in the 'roaring buckie' (*F.* or *Neptunea antiquus*), to which, as Wordsworth tells us, the curious child applies his ear and listens for the sonorous cadences of the native sea. This common species is often dredged with oysters, &c., and used for bait, or even eaten. The shell, generally about 6 inches long, is or was used for a lamp in the cottages of the Shetland

fishermen. The nests or egg-cases are curious, like those of the Whelk (q.v.). *F. colossus* is about a foot long; *F. tuctoni*, from Scarborough, is a treasure of conchologists.

Futa Jallon, a large area under French protection lying NE. of Sierra Leone, and forming the 'hinterland' to the French coast-colony of Rivières du Sud. The area is given at 30,000 sq. m., and the pop. (who are Fulahs) at 600,000. It is a hilly, healthy country, lying round a lofty mountain mass, and contains some of the head-streams of the Gambia, the Senegal, and the Niger.

Futehgunge, &c. See FATEHGANJ, &c.

Future State. See ESCHATOLOGY.

Fuze, a means of igniting an explosive at the required instant, whether it is used in blasting operations, military demolitions and mines, or as the bursting-charge of a shell or Bomb (q.v.). In the former cases electricity would generally be used, but for hasty military demolitions Bickford's fuze is employed in the British army. It is of two kinds—'instantaneous' and 'ordinary,' the first burning at 30 feet a second, the other at 3 feet a minute. The 'ordinary' consists of a train of gunpowder in layers of tape covered with gutta-percha; in the 'instantaneous,' which is distinguished by crossed threads of orange worsted outside, quick-match takes the place of the gunpowder. Powder hose is sometimes used when no other fuze is available. It is made of strips of linen, forming, when filled with powder, what is called a 'sausage,' ½ to 1 inch in diameter.

The fuzes used for shells are of a totally different character and of many patterns. They are of two classes, those which depend for their action upon the rate of burning of the composition in them, called 'time'-fuzes, and those which burst the shell on its striking the target, ground, or water, called 'percussion'-fuzes. In the British army time-fuzes are hollow truncated cones of beech-wood, carrying a column of fuze-composition which burns at a fixed rate—marks and figures on the outside show twentieths of a second or less, and indicate where the hole must be made by a fuze-borer in order that the flame may have access through it to the bursting-charge, and so open the shell at the desired instant during its flight. They are chiefly used with Shrapnel Shell (q.v.) and mortars. Their length varies from 3 to 6 inches, and they are fixed in to the head of the shell before firing. The thickness of iron would prevent the passage of the flame through the hole made by the borer in the shorter fuzes, and therefore two or more powder channels are made in them, parallel to the fuze-composition, to communicate its flame to the bursting-charge. In guns having windage the fuze is ignited by the flame of the cartridge enveloping the shell, and quickmatch is placed on the top of the fuze to facilitate this. A metal cover protects the quickmatch until the last moment, and is then torn off by means of a tape provided for that purpose. In guns having no windage a percussion arrangement is placed in the head of the fuze, so that the shock of discharge may ignite the fuze-composition. Fig. 1 shows a section of the common time-fuze, through one powder channel. A section of the percussion-fuze designed in the Royal Laboratory at Woolwich is shown in fig. 2. It is a hollow gun-metal cylinder, *a*, arranged so as to screw into the head of the shell. Inside is a movable *pellet* or ring, *b*, of white metal driven with fuze-composition like a tube, and carrying a percussion-cap. It has four *feathers* or shoulders projecting from its sides, and above these a gun-metal *guard*, *c*, fits round the pellet loosely, so as to prevent the cap of the pellet coming into contact with a steel pin which projects downwards from the top of the fuze. A safety pin, *d*, goes through the fuze with the same object, but is removed before firing, and a lead pellet, *e*, then closes the aperture left by its removal. On discharge the shock causes the guard to shear off the feathers, and set back with the pellet against the bottom of the fuze. The shock of impact on the target or ground causes the pellet to set forward, bringing the cap against the pin, igniting the fuze-composition, and bursting the shell. Percussion-fuzes are chiefly used with 'common' Shell (q.v.). Very many others are in use, chiefly modifications of these two types—e.g. the 'delay' action fuze has both a percussion and time arrangement, so as to burst the shell an instant after impact. All are delicate and apt to deteriorate hopelessly with age or exposure to damp. In the American pneumatic dynamite gun, the shell contains an electric battery, and the circuit is completed by the shell striking either water or the target.

Fig. 1.

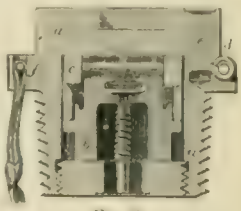


Fig. 2.

Fylfot. See CROSS.

Fyne, LOCH, a sea-loch of Argyllshire, running 40 miles northward and north-eastward from the Sound of Bute to beyond Inveraray. It is 1 to 5 miles broad, and 40 to 70 fathoms deep. On the west side it sends off Loch Gilp (2¾ × 1¼ miles) leading to the Crinan Canal. Loch Fyne is celebrated for its herrings.

Fyrd, the old English Militia. See MILITIA.

Fyzabad (better *Faizabad*), a city of Oudh, on the Gogra, 78 miles E. of Lucknow by rail. Built on part of the site of Ajodhya (q.v.), it was the capital of Oudh from 1760 to 1780, but is now greatly fallen from its old-time splendour, most of its Mohammedan buildings being in decay. It maintains, however, a trade in opium, wheat, and rice. Pop. (1891) including cantonments, 78,921.—The area of Fyzabad *district* is 1728 sq. m., with 1,216,959 inhabitants; of Fyzabad *division*, 12,177 sq. m., with a pop. of 6,794,272. For the capital of Badakhshan, see FAIZABAD.

G

is the seventh letter in the Roman alphabet, and in the modern alphabets derived from it. For the history of the character, and its differentiation out of C, see ALPHABET and letter C. The earliest inscription in which G is found is the epitaph on Scipio Barbatus, which Ritschl considers was inscribed not later than 234 B.C. The substitution of G in the Roman alphabet for the disused letter Z, which occupied the seventh place in the old Italic alphabet, is believed to have been effected in the school of Spurius Carvilius, a grammarian who lived at the close of the 3d century B.C. In our minuscule g, which is derived from the Caroline script, the two loops do not belong to the majuscule form G, of which the little crook at the top of *g* is the sole survival. In Latin the sound of *g*, as in *gaudeo*, *genus*, *age*, was always hard, as in the English *got*; our soft sound, which is heard before *e* and *i* in *gist*, *generous*, and *gentle*, did not come into use in Latin before the 6th century A.D. In English this soft sound is confined to words of foreign origin, such as *gem* and *gender*, and is due to French influence. An initial *g* in words of English origin is always hard, even before *e*, *i*, and *y*, as in *gave*, *get*, *give*, and *go*.

The Normans could not sound our *w*, and substituted for it *gu*. Hence we have such doublets as *guardian* and *warden*, *guarantee* and *warranty*. Conversely a French *g* sometimes becomes *w* in English. Thus the old French *gauffre* has given us our word *wafer*. G is often softened to *y*, *e*, *i*, or *a*. Thus Old English *genoh* is now *enough*, *gelic* is *alike*, *git* is *yet*, *geong* is *young*, *handgeweorc* is *handiwork*, *sælig* is *silly*. A final or medial *g* often becomes *w* or *ow*; thus the Old English *fugol* is now *fowl*, *maga* is *maw*, *sorg* is *sorrow*, *lagu* is *law*, *elnboga* is *elbow*. Sometimes *g* disappears altogether, as in the Old English *gif*, which is now *if*; *is-gicel*, which is *icicle*; or *magister*, which is *master* and *mister*. Before *n* we occasionally have an intrusive *g*, as in the words *foreign*, *feign*, *sovereign*, and *impregnable*. An Old English *h* sometimes becomes *gh*, and then lapses to *f*, as in *enough* and *draught*. In the case of many words, such as *gate*, *get*, and *again*, we owe to Caxton, under Mercian influences, the restoration of the Old English *g*, which for three hundred years had in Wessex been gradually lapsing into *y*.

Gabbro (Ital.), a rock consisting essentially of the two minerals plagioclase Felspar (q.v.) and Diallage (q.v.). It shows a thoroughly crystalline granitoid texture, with no trace of any base. The plagioclase is a basic variety—labradorite being commonest, but anorthite is also sometimes present in abundance. The diallage may usually be noted by the pearly or metalloidal lustre on its cleavage-planes. It is usually either brownish or dirty green in colour. Olivine is also often met with as a constituent of gabbro, and some apatite is almost invariably present. In certain kinds of gabbro other varieties of pyroxene appear; and amongst other minerals which occasionally occur in gabbro may be mentioned hornblende, magnesia-mica, magnetite, ilmenite, quartz. The rock is of igneous origin, and occurs in association with the crystalline schists as large amorphous masses or bosses. Sometimes also it appears in the form of thick sheets and bosses associated with volcanic eruptive rocks.

Gabelentz, HANS CONON VON DER, German philologist, was born at Altenburg, 13th October 1807. Even whilst still a student at Leipzig and Göttingen he spent a large part of his time in the study of Chinese and Arabic. He then began to study the Finno-Tartaric languages, and published in 1833 his *Eléments de la Grammaire Mandschoue*. He had, moreover, a share in the establishment (1837) of *Zeitschrift für die Kunde des Morgenlandes*, a journal devoted to oriental science, and contributed to it some interesting papers on the Mongolian and Mordvinian languages. Along with J. Löbe he published a critical edition of the Gothic translation of the Bible by Ulfilas, with a Latin translation, and with a Gothic glossary and grammar appended (1843–46). Besides a grammar of Syrjan (a Finnish dialect, 1841), he furnished contributions to periodicals on the Swahili, Hazara, Formosan, and Samoyede languages. His most important work on the science of language is *Die Melanesischen Sprachen* (2 vols. 1860–73). *Beiträge zur Sprachenkunde* (1852) contains Dyak, Dakota, and Kiriri grammars, whilst *Ueber das Passivum* (1860) is a treatise on universal grammar. In 1864 he published a Manchu translation of the Chinese works, *Sse-chu*, *Shu-king*, and *Shi-king*, along with a glossary in German. Gabelentz knew upwards of eighty languages. He died 3d September 1874.—His son, Hans Georg Conon (1840–93), held the chair of Eastern Asiatic Tongues in Leipzig University, and wrote many books on Chinese, Melanesian, Basque, and Berber, &c.

Gabelle (derived through Low Lat. *gabulum* from the Old Ger. *gifan* or Gothic *giban*, 'to give'), in France a word sometimes used in a general way to designate every kind of indirect tax, but more especially the tax upon salt. This impost, first levied in 1286, in the reign of Philippe IV., was meant to be only temporary, but was declared perpetual by Charles V. It varied in the different provinces. It was unpopular from the very first, and the attempt to collect it occasioned frequent disturbances. It was finally suppressed in 1789. The word also indicated the magazine in which salt was stored. The name *gabelou* is still given by the common people in France to custom-house officers and tax-gatherers.

Gabelsberger, FRANZ XAVER, the inventor of the system of shorthand most extensively used in German-speaking countries, was born 9th February 1789 at Munich, and entered the Bavarian civil service, acting as ministerial secretary in the statistical office of the finance department from 1826 to the date of his death, 4th January 1849. The summoning of a parliament for Bavaria in 1819 led Gabelsberger to adapt the shorthand

system which he had invented for his own private use to the purpose of reporting the proceedings of the parliament. Discarding straight lines and sharp angles, he endeavoured to construct a series of signs which should conform as closely as possible to the written signs of German, and for his models went back to the majuscule forms of the so-called Tironian signs employed in Latin. His system is now used for reporting parliamentary proceedings in most of the countries in which German is the official language; and it has also been adapted to the languages of several countries outside of Germany. Gabelsberger published an account of his system in *Anleitung zur Deutschen Redezeichenkunst oder Stenographie* (2d ed. 1850). See Gerber, *Gabelsbergers Leben und Streben* (1868).

Gaberlunzie, an old Scotch term for a beggar, from his wallet. The word is no doubt originally of the same origin as the English *gaberdine*, 'a cloak,' from the Spanish *gaban;* the second part the same as *loin*, the part on which the wallet rests. There is extant a fine old ballad of a young lover who gained access to his mistress through adopting the disguise of the gaberlunzie-man.

Gabes. See Cabes.

Gabion (Ital. *gabbia*, related to Lat. *cavea*, 'hollow'), a hollow cylinder of basket-work, 3 feet high and 2 in diameter, employed in fortification for revetting purposes—i.e. to retain earth at a steep slope. A *sap-roller* consists of two concentric gabions, one 4 feet, the other 2 feet 8 inches in diameter, the space between being wedged full of pickets of hard wood, so as to form a movable protection for the men working at a saphead. See Mines.

Gabirol. See Avicebron.

Gable, the triangular part of an exterior wall of a building between the top of the side-walls and the slopes of the roof. The gable is one of the most common and characteristic features of Gothic architecture. The end walls of classic buildings had Pediments (q.v.), which followed the slope of the roofs, but these were always low in pitch. In medieval architecture gables of every angle are used with the utmost freedom, and when covered with the moulded and crocketed copes of the richer periods of the style, they give great variety and beauty of outline.

Gablets, or small gables, are used in great profusion in connection with the more decorative parts of Gothic architecture, such as canopies, pinnacles, &c., where they are introduced in endless variety along with tracery, crockets, and other enrichments.

The towns of the middle ages had almost all the gables of the houses turned towards the streets, producing great diversity and picturesqueness of effect, as may still be seen in many towns which have been little modernised. The towns of Belgium and Germany especially still retain this medieval arrangement. In the later Gothic and the Renaissance periods the simple outline of the gable became stepped and broken in the most fantastic manner. This method of finishing gables has again become popular, all sorts of curves and twists being adopted. See Corbie steps.

Gablonz, a town of the north of Bohemia, 6 miles SE. of Reichenberg, celebrated for its glass manufactures. The town has also textile industries and porcelain-painting. Pop. 14,653.

Gaboon, a French colony on the west coast of Africa between the Atlantic and the middle Congo. Its north boundary touches the German colony of the Cameroons; its south boundary touches Portuguese Kabinda and the Congo State; and to the east the territory stretches along the Mobangi (Ubanghi) to the British sphere, and northward, behind the (German) Cameroon country to Lake Tsad. Area, 300,000 sq. m. Inlets into the coast are Corisco Bay and the estuaries of the Gaboon and Ogowé (q.v.), which, with the Kwilu, are the principal rivers of the colony. The Gaboon, 10 miles wide at its entrance, penetrates 40 miles inland, with a width varying between 6 and 12 miles. On the north bank, which is tolerably high, is the European settlement of Libreville; the south bank is low and marshy. Its chief affluents are the Como or Olombo from the east and the Remboe from the south. Besides these the Licona, Alima, and Lefini, about which but little is known, flow eastwards into the Congo. The climate on the coastal strip is extremely unhealthy; mean annual temperature, 83° F. On the inland plateau (2600 feet above sea-level) it is better. The interior has not yet been fully explored; certain parts, as the basin of the Ogowé, the region around the sources of the Licona, the Kwilu region, and the coast-lands, are fertile and rich in natural resources. Amongst the exports figure timber, gum, ivory, gutta-percha, palm oil and kernels, earth-nuts, sesamum, and malachite; other products are brown hematite, quicksilver, sugar-cane, cotton, and bananas. The principal imports are salt, spirits, gunpowder, guns, tobacco, cotton goods, and iron and brass wares. All agricultural operations are performed by women. The coast tribes engage in trade, which is particularly active around Loango in the south-west and on the Gaboon. The people belong for the most part to tribes of the Bantu stock, the more important being the Mpongwe, the Fans, Bakele, Bateke, &c. Sheep and goats are numerous, but the former yield no wool. This part of Africa was discovered by the Spaniards in the 15th century. The French made their first settlement on the Gaboon estuary in 1842; twenty years later they extended their sway to the Ogowé. But they seem never to have attached any importance to the colony until after Savorgnan de Brazza (q.v.) began to explore it in 1876–86. With the Ogowé (q.v.) territory, the Gaboon is now called French Congo. Franceville is the principal station in the interior. See books on the region by Dubreuil de Rhins (1885), Barret (1887), besides the works on the French Colonies.

Gaboriau, Émile, the great master of 'police novels,' was born in 1835 at Saujon in Charente-Inférieure, and was only saved from mercantile life by a timely discovery that he could write. He had already contributed to some of the smaller Parisian papers, when he leaped into fame at a single bound with his story *L'Affaire Lerouge* (1866) in the feuilleton to *Le Pays*. It was quickly followed by *Le Dossier 113* (1867), *Le Crime d'Orcival* (1868), *Monsieur Lecoq* (1869), *Les Esclaves de Paris* (1869), *La Vie Infernale* (1870), *La Clique Dorée* (1871), *La Corde au Cou* (1873), *L'Argent des Autres* (1874), and *La Dégringolade* (1876). Gaboriau died suddenly, 28th September 1873.

Gabriel (Heb., 'man of God') is, in the Jewish angelology, one of the seven archangels (see Angel). The Mohammedans hold Gabriel in even greater reverence than the Jews; he is called the spirit of truth, and is believed to have dictated the Koran to Mohammed.

Gachard, Louis Prosper, writer on the history of Belgium, was born at Paris, 12th March 1800. He spent the greater part of his life as keeper of the archives at Brussels. He died 24th December 1885. He edited from the national archives of Belgium and Spain the correspondence of William the Silent (1847–58), Philip II. (1848–59), Margaret of Austria (1867–81), and Alba (1850); and wrote *Les Troubles de Gand sous Charles V.*

(1846), and *Retraite et Mort de Charles V.* (1854–55), besides other books dealing with the history of Belgium.

Gad, the seventh son of Jacob by Zilpah, the handmaid of Leah, and founder of an Israelitish tribe numbering at the exodus from Egypt over 40,000 fighting-men. Nomadic by nature, and possessing large herds of cattle, they preferred to remain on the east side of Jordan, and were reluctantly allowed to do so by Joshua, on condition of assisting their countrymen in the conquest and subjugation of Canaan. Their territory lay to the north of that of Reuben, and comprised the mountainous district known as Gilead, through which flowed the brook Jabbok, touching the Sea of Galilee at its northern extremity, and reaching as far east as Rabbath-Ammon. The men of Gad were a stalwart fighting race—eleven of its heroes joined David at his greatest need. Jephthah the Gileadite, Barzillai, Elijah the Tishbite, and Gad 'the seer' were in all probability members of this tribe.

Gadames, or more accurately GHADAMES (the *Cydamus* of the Romans), is the name of an oasis and town of Africa, situated on the northern border of the Sahara, in 30° 9′ N. lat. and 9° 17′ E. long. The entire oasis is surrounded by a wall, which protects it from the sands of the desert. The streets are narrow and dark, being covered in to shield them from the sun's rays. The gardens of Gadames, which grow dates, figs, and apricots, owe their fertility to a hot spring (89° F.), from which the town had its origin. The climate is dry and healthy, though very hot in summer. The town is an entrepôt for manufactures and foreign goods from Tripoli to the interior, and for ivory, beeswax, hides, ostrich-feathers, gold, &c., from the interior to Tripoli. The slave-trade is now completely abolished. Pop. between 7000 and 10,000, mostly of Berber descent, and in religion devoted Mohammedans.

Gad'ara, formerly a flourishing town of Syria, in the Decapolis, a few miles SE. of the Sea of Galilee, but now a group of ruins. It was the capital of Peræa, and in all probability the chief town in the New Testament 'country of the Gadarenes' (cf. Mark, v.). It endured sieges by Alexander Jannæus and Vespasian, but fell into decay after the Mohammedan conquest.

Gaddi, the name of three Florentine painters. (1) GADDO GADDI, born about 1259 at Florence, where he died about 1332. None of his paintings have survived, unless four of the frescoes in the upper church at Assisi are from his hand. Of his mosaics there remain specimens in S. Maria Maggiore at Rome.—(2) TADDEO GADDI, son and pupil of the preceding, was born about 1300 in Florence, and died there after 1366. A disciple of Giotto, he painted frescoes representing the life of the Virgin in the Baroncelli Chapel of the church of the Holy Cross at Florence; a triptych of the Virgin and Child, now at Berlin; another similar one at Naples; and other frescoes at Pisa and Florence. As a painter he possessed little original inspiration.—(3) AGNOLO GADDI, son and pupil of Taddeo, born about 1330, died in October 1396. At Prato he executed a series of frescoes depicting the history of the Virgin's Sacred Girdle, and in the church of the Holy Cross at Florence another series showing the history of the Cross. Besides these he painted some altarpieces. Later in life he settled at Venice, and devoted himself to commercial pursuits.

Gade, NIELS WILHELM, musical composer, born at Copenhagen 22d February 1817. He became known by his *Echoes of Ossian* (1841), studied at Leipzig, and became Mendelssohn's successor as leader of the Gewandhaus concerts there. In 1868 he was appointed master of the Chapel Royal at Copenhagen. Author of symphonies, the *Erl King's Daughter*, &c., he died 21st December 1890.

Gades. See CADIZ.

Gad-fly. See BOT.

Gadi'dæ (Cod-fishes), an important family of bony fishes in the sub-order Anacanthini (see BONY FISHES), including many of the most important food-fishes, such as cod, haddock, whiting, and other species of Gadus, the hake (Merluccius), the fresh-water burbot (Lota), and the ling (Molva). The general characters will be readily gathered from the articles on these fishes. Most of the Gadidæ are littoral and surface fishes, but not a few, such as Chiasmodus (figured under FISHES), Halargyreus, the deep black Melanonus discovered by the *Challenger*, and Haloporphyrus, inhabit the deep sea, while a few species (e.g. burbot) live in fresh water. They vary greatly in size, from giant cod, hake, and ling four feet or so long to the dwarf-fish (Bregmaceros) of tropical seas, which measures only about three inches. See COD, and similar articles.

Gadsden, CHRISTOPHER, an American patriot, born in Charleston, South Carolina, in 1724, was educated in England, and became a successful merchant in Philadelphia. He was a member of the first Continental congress (1774), rose to the rank of brigadier-general during the revolution, was lieutenant-governor of South Carolina, and suffered nearly a year's imprisonment by the British. He died 28th August 1805.—His grandson, JAMES GADSDEN, born in Charleston, 15th May 1788, served as lieutenant-colonel of engineers in the war of 1812, and as Jackson's aide against the Seminole Indians. In 1853 he was appointed minister to Mexico, and negotiated a treaty under which the United States purchased a large section of territory, 'the Gadsden Purchase,' now forming part of Arizona (q.v.) and New Mexico. He died 25th December 1858.

Gadshill, 3 miles NW. of Rochester, commands a splendid prospect, and was the scene of Falstaff's famous encounter with the growing number of 'rogues in buckram suits.' Gadshill Place, an old fashioned red-brick house here, which Dickens coveted as a boy, was bought by him in 1856, and was his permanent residence from 1860 till his death in 1870.

Gadwall (*Anas strepera*), a species of duck, not quite so large as the mallard, a rare visitant of Britain, but abundant in many parts of the continent of Europe, and equally so in Asia and in

Gadwall (*Anas strepera*).

North America. Being a bird of passage, it occurs also in tropical regions—e.g. the north of Africa.

It breeds in marshes, and lays from seven to nine eggs. Its voice is loud and harsh. It is much esteemed for the table, and is common in the London market, being imported chiefly from Holland.

Gæa, or GE, in Greek Mythology, the goddess of the earth, appears in Hesiod as the first born of Chaos, and the mother of Uranus and Pontus. She also bore the Titans, Cyclopes, Erinyes, Giants, &c. As the vapours which were supposed to produce divine inspiration rose from the earth, Gæa came to be regarded as an oracular divinity; the oracles at Delphi and Olympia were believed to have once belonged to her. Her worship extended over all Greece, black female lambs being offered on her altars. She was also the goddess of marriage, and again of death and the lower world. At Rome Gæa was worshipped under the name of *Tellus*.

Gáekwár. See GUICOWAR.

Gaelic Language and Literature. Gaelic is the language of the Goidel or Gael. The term includes Irish and Manx as well as Scottish Gaelic, though popular usage frequently restricts its application to the last alone. The tribes who spoke this language were known to the Romans as *Scoti*; and native authors, especially when they wrote in Latin, sometimes made use of the word to designate the people. Their principal home was in Ireland, and accordingly with writers like Adamnan *Scotia* is 'Ireland,' and *lingua Scotica*, 'Gaelic.' About the beginning of the 6th century a fresh colony of these Scots settled in Argyllshire, and founded the sub-kingdom of Dalriada. They were followed some sixty years later by Columba's mission to Iona. The people prospered in their new home, and by the middle of the 9th century Kenneth MacAlpin, one of their race, became king of Pictland as well as of Dalriada. In after-years the names *Scotia* and *lingua Scotica* followed these successful colonists, and Scotland became the name of the kingdom founded by them. At a later period *Scot* and *Scottis toung* were applied to the Teutonic tribes settled in Scotland and their speech, and then it became customary to speak of Gaelic as *Irish*, or corruptly *Ersch* and *Erse*. But to the people themselves such designations are unknown. With them Scotland has always been *Alba*, *Albainn*, as distinguished from *Eirinn*, 'Ireland,' and *Sasunn* (Saxon), 'England;' and a Scotsman, whether Celt or Teuton, is *Albannach*. They themselves are *Gaidheil*, 'Gaels,' in contradistinction to *Gaill*, 'strangers,' a word applied of old as a general term to the Norwegian and Danish invaders, but now to the Lowland Scot; their territory is *Gaidhealtachd*, 'Gaeldom,' as distinct from *Gallduchd* or 'Lowlands;' and their speech *Gaidhlig*, 'Gaelic,' in contrast to *Beurla*, formerly *Belre*, a word originally signifying 'language' simply, afterwards an 'unknown' or 'foreign tongue,' and now among Highlanders restricted to the foreign tongue best known to them—'English.' When it becomes necessary to differentiate, they speak of *Gaidhlig Albannach*, 'Scottish Gaelic;' *Gaidhlig Eirionnach*, 'Irish Gaelic;' and *Gaidhlig Mhannanach*, 'Manx Gaelic.'

What the language of the tribes occupying the north of Scotland, and collectively spoken of by the Romans as Picts, was, is not definitely ascertained. As in their blood, so in the speech of these people, there was probably a dash of pre-Celtic. That the language was largely a Celtic dialect is proved by such names as *Caledonia*, the root of which we have still in *coill*, in origin as in meaning the equivalent of *holz*; *Clota*, now *Clunaidh*, 'the Clyde,' a word equated by Whitley Stokes with *cluere*, 'to wash;' *Orcades*, 'isles of *orc*;' or, restoring initial *p*, 'isles of *porc*'—i.e. 'pigs' or 'whales'—a whale being still in Gaelic a 'sea-pig.' The idioms of Pictland in those days seem to have been, in so far as Celtic, more closely allied to the Brythonic than to the Goidelic dialects (see CELTS); but the Dalriads, powerfully backed by the Columban clergy, afterwards made Gaelic the ruling speech over the whole kingdom. It was the language of the court until Malcolm Canmore's day. The political and ecclesiastical ideas which Queen Margaret favoured were hostile to Gaelic, which from her time has been retiring steadily though slowly north and west. We get a glimpse now and again of its retreating footsteps. Gaelic was the vernacular of Buchan in the 12th century, probably much later. The ability to speak the language is one of the accomplishments credited to James IV. by the distinguished Spanish ambassador, Don Pedro Pueblo. It was spoken in Galloway in Queen Mary's reign, and the echoes of the old tongue lingered in the uplands of Galloway and Carrick down to the 18th century. It was the mother-tongue of George Buchanan, Scotland's greatest scholar, born at Killearn in Stirlingshire. Captain Burt mentions that until shortly before the Union, when the farmers of Fife sent their sons as apprentices to the Lothians, it was made a condition of indenture that the boys should be taught English. The sweeping measures taken to punish the Clans who took part in the rebellion of 1745; the introduction of sheep-farming into the north; the spread of education; facilities of communication by steam and rail; the extension of the suffrage—all have in their way been the means of introducing the use of the English tongue into even the remoter parts of the Highlands, though without largely contracting the Gaelic-speaking area. This venerable language is still spoken over the whole of Arran, Argyll, Inverness, Ross, and Sutherland; in considerable portions of Perth and Caithness; and in the upland corners of Dumbarton, Stirling, Aberdeen, and Banff. According to the census of 1891 the number of persons who spoke Gaelic only in Scotland was 43,738, while 210,677 spoke both Gaelic and English. Emigrants from the Highlands carried their mother-tongue to America and Australia. In the end of last century Gaelic took root in Carolina; but the use of it in the United States and in Australia is largely on the wane. The language is, however, preached to large and flourishing congregations throughout wide tracts of the Dominion of Canada. Through the exertions of Professor Blackie a Celtic chair was founded in 1882 in the university of Edinburgh; and by the deed of foundation the professor is bound to make 'provision for a practical class in the uses and graces of the Gaelic language, so long as that language shall be a recognised medium of religious instruction in the Highlands of Scotland.'

From the Dalriadic immigration until the Norwegian and Danish invasions, a period of 300 years, Ireland and Gaelic Scotland may be looked upon as one. The language and literature of both were the same. The Norwegian settlement caused a temporary dislocation. The Hebrides were placed under one government with the Isle of Man, and to this day a Manxman finds Gaelic more intelligible than Irish. During this period Scottish Gaelic, separated from the parent tongue, and subjected on the one side to Norse, on the other to Pictish influence, developed certain characteristics which are still traceable. But, when things settled down, the old ecclesiastical and literary relations between the Highlands and Ireland were resumed, and maintained until the Reformation. A common literature checked the tendency of the two dialects to diverge. Accordingly, the differences between Scottish and Irish Gaelic may be regarded as mere variations of dialect, which in the spoken tongues shade into each other. In point of language Ulster is as far removed from Munster as from

Islay. Again, an Islayman feels as much at home in Antrim as in Assynt, and his *patois* differs less from either than that of Liddesdale differs from Buchan. The printed books show greater variations, but these are more in appearance than in reality. Manx is written phonetically, and to a Gaelic reader the page looks strange at first sight. Irish is written as a rule in the old characters, and aspiration is marked by a dot over the letter affected. Gaelic, on the other hand, has adopted the Roman alphabet, and aspiration is indicated, except in the case of infected *l*, *n*, *r*, by the addition of the letter *h*. Irish writers make a liberal use of archaic and obsolete forms, while the aim of Highland authors is to bring the written language and the spoken tongue more into line. In both there has been great loss of inflexion in noun and verb; but on this down grade Scottish Gaelic has progressed even more rapidly than Irish. But in all essential features the two are one language, with a copious vocabulary, the native stores being largely supplemented from foreign sources, especially Latin and English, and with probably an infusion from a pre-Celtic non-Aryan speech. The distinctive Celtic law which places two words that are in close grammatical relation under one main accent, and treats them for the time being phonetically as one word, holds true in all the Celtic dialects, Brythonic and Goidelic alike. Under this law, initial aspiration, due to vocalic *auslaut*, follows the same rules in Irish and Scottish Gaelic; but while the nasal *auslaut*, technically termed eclipsis, proceeds in written Irish with all the regularity of the multiplication table, in spoken Gaelic this phonetic change appears only sporadically, and native grammarians have ignored it altogether.

Among the more noticeable differences between Irish and Scottish Gaelic are the following. In both the accent or stress is on the root-syllable of the word, but Scottish Gaelic exhibits a tendency to follow the English fashion of throwing the accent as far back as possible. Besides, in the case of complex substantives, such as diminutives, &c., which have usually a principal and subsidiary accent, while Irishmen place the main accent on the terminal syllable, Highlanders (and here Ulster joins them) keep the principal accent on the root-syllable. Irish *cnócán*, 'a hillock,' from *cnoc*, 'a hill,' is in Scotland *cnócàn*; Irish *dúilleóg*, 'a leaflet,' from *dúille*, 'a leaf,' Gaelic *dúilleàg*, &c. Scottish Gaelic, under Norse influence it may well be, takes in many cases the broad sound of *a*, where Irish adheres to the older *o*: *cos*, 'foot,' is in Scottish Gaelic *cas*; *focal*, 'vocalis,' *facal*. In the north Highlands the practice is carried further than in the south: *pòg*, 'kiss,' is *pàg* in Sutherland. Even so the open long *e*, sometimes also long *i*, is in the north Highlands diphthongised into *ia*, where south Argyll, like Ireland, is satisfied with the old sound: *fiar* for *fiar*, 'grass;' *niul* for *neul*, 'cloud;' so *fian* for *fion*, 'vinum,' &c. With the exception of masculine *o*-stems, the nominative plural of nouns in Scottish Gaelic assumes a final *n*, while Irish abides by the old vocalic ending: Scottish Gaelic *casan*, 'feet,' Irish Gaelic *cosa*; Scottish Gaelic *léintean*, 'shirts,' Irish Gaelic *léinte*, &c. In the verb, Highlanders use the analytical form in some cases where Irishmen have preserved the synthetic. Because of the loss of inflexion, auxiliary verbs in Gaelic as in English have continually to be called in to form mood, tense, and voice. Except in the case of *is*, *ta*, *bheil*, all different roots forming the substantive verb, there is no separate form for the present tense in Gaelic. The *b*-future still survives in both dialects, but the characteristic consonant *f* has disappeared from Scottish Gaelic, and has hardly left its ghost behind: the Irish *cuirfidh* is now simply *cuiridh* in the Highlands.

Gaelic literature in Scotland dates from St Columba. The great missionary was an ardent student and an accomplished scribe; and succeeding abbots of Iona followed in the footsteps of the illustrious founder of the monastery. Ecclesiastics wrote in those days for the most part in Latin. It was a period of great literary activity as well as of missionary enterprise. But of the many works produced at this time few survive. With all his passion for his native saga, the Norseman, in his heathen days, made short work of the books and bells of priests. During the Danish invasions, monks fled in large numbers to the Continent, sometimes taking their MSS. along with them. So we find that while little more than a dozen books written by Gaelic scholars before the 10th century are to be found in the British Isles, there are over 200 MSS. of this period preserved in Austria, Italy, Switzerland, Germany, France, and Belgium. Many of these may have been written in Scotland; two certainly were. A copy of Adamnan's *Life of Columba*, written in Iona before 713 A.D., is now in the public library of Schaffhausen. The Book of Deer, a MS. of the 9th century, is in Cambridge. With the exception of some half-dozen MSS. in the university of Edinburgh, in the library of the Society of Antiquaries, and in private hands, all the MS. literature of the Gael preserved in this country has been, mainly through the influence and patriotism of Dr Skene, deposited for preservation and reference in the library of the Faculty of Advocates, Edinburgh. This collection consists of sixty-four separate parcels, many of them being several MSS. bound together for the convenience of the owner. A large number of them were written within the last 250 years; a few are 500 years old. Many are mere tattered scraps of paper, illegible through damp, decay, and neglect; several are beautiful vellums of exquisite workmanship, as fresh as in the day they were written. About half of the total number are the property of the Highland and Agricultural Society of Scotland. Thirty-two MSS., including nearly all the oldest parchments, are known to have once belonged to the M'Lachlans of Kilbride, in Nether Lorn, Argyllshire. This portion was long supposed to have formed a part of the lost library of Iona.

The greater number of the oldest of these MSS. are indistinguishable from the Irish MSS. of the same date. Since Norse days Scottish Gaelic has had a separate individuality, but of this the MSS. take little or no account. The centre of Gaelic learning and culture was in Ireland and Dalriada. Accordingly, we hear comparatively little of the Pict, his language, beliefs, and traditions. The men of the Isles fought and fell at Bannockburn and Flodden; but though Irish and Norse heroes are household words with Hebridean bards, Bruce and Wallace are unknown to them. In the middle and north Highlands the political sympathy with the central government was not perhaps much stronger than in the west, but the linguistic and literary connection with Ireland was much less close. Accordingly, we find in the MS. of the Dean of Lismore, written by a native of Glenlyon in Perthshire, between 1512 and 1530, and at a later period in the Fernaig MS., written by Duncan M'Rae in Kintail in the latter half of the 17th century, a wide departure from the traditions of Gaelic scholars. Highlandmen and their affairs obtain prominence; the language is not merely Scottish Gaelic, but frequently the provincial idiom of the scribe; the writing is in the current Scottish hand and character of the day; and the orthography

is more or less phonetic, a method adopted partly perhaps in ignorance, partly from impatience, of the strict and highly artificial rules of the schools.

The MSS. in the Scottish collection frequently supply valuable variants, sometimes welcome additions, to the large Irish collections. The subject-matter of several is religious—lives of saints, such as Columba and St Margaret; passions and homilies, such as are found in the *Leabhar Breac*, or 'Speckled Book.' In MS. I. (Skene's catalogue) is the Passion of our Lord as revealed to Anselm, written down in 1467 by Dugald, son of the son of Paul the Scot, a treatise not to be found in the 'Speckled Book.' A few deal with philology and kindred matters. In MS. I., for example, is preserved a copy of the Books of Primers (*Cuiricht nan Espos*, as in the Book of Ballymote. Several MSS. contain translations of portions of the heroic history of Greece and Rome: the destruction of Troy, the labours of Hercules, the expedition of Jason; also the wars of Pompey and Cæsar. The genealogies, tales, mythical and legendary, of the peoples and races that inhabited Ireland, and of *Lochlannaich* or Scandinavians, are endless. The most imaginative pieces, such as the voyage of *Maelduin* and the adventures of *Conall*, are in prose, with verse interspersed. Several historical documents and even calendars, such as that of Oengus the Culdee, are, on the other hand, thrown into the form of verse. Gaelic poetry is all lyric, the epic and the drama, as literary forms, being unknown to the people. The line as a rule is smooth and flowing, with an exceeding richness and variety of verse. In poetry as in prose the style is frequently inflated; and the language, whether of praise or blame, unmeasured, exaggerated. The literature shows that the Scottish Gael is witty rather than humorous, and that his perception of the beautiful in external nature is ever lively and true.

The most characteristic features of the Scottish collection are the almost total absence of annals, and the great richness of the medical section. Two folios relating to Irish events (1360–1402) bound up in MS. II., and the history of the Macdonalds of the Isles (MS. L.) are, apart from genealogies, pretty nearly all that deal with affairs within historic times. That records were written in Gaelic we know from various sources, though the memoranda in the Book of Deer and the Islay Charter of 1408 are almost all that survive. On the other hand, fully a third of the whole Scottish collection is medical or quasi-medical. These MSS. consist of treatises on anatomy, physiology, botany, and pharmacy. Several are translations with commentaries of portions of Aristotle's works, of Galen, Hippocrates, Bernardus Gordonus, Averroes, Isidore, &c.; but the strictly medical discussion frequently branches off now to metaphysics and theology, now to astrology and alchemy. The greater part of these scientific documents were at one time the property of the M'Bheaths or Beatons or Bethunes, for many generations family physicians in Islay, Mull, and Skye. These medical books may not perhaps claim to be of great scientific value; but they are of high interest and importance as a most reliable piece of evidence regarding the state of learning and culture in the West Highlands during what we complacently call the dark ages.

The first book printed in a Gaelic dialect was John Knox's Liturgy, translated into Gaelic by Bishop Carsewell of Argyll, and published in Edinburgh in 1567. Up to the middle of the 18th century not more than twenty Gaelic books were printed, and these consisted mainly of successive editions of the Psalms, Shorter Catechism, and Confession of Faith. The number of separate publications now amounts to several hundreds. A very complete and accurate account of Gaelic books printed before 1832 is given in Reid's *Bibliotheca Scoto-Celtica*. Professor Blackie, in his *Language and Literature of the Scottish Highlands* (1876), has given admirable translations of the best efforts of modern Gaelic authors. These consist for the most part of a succession of lyric poets who have flourished during the last 300 years. Foremost among them are Mary MacLeod (*nigh'n Alastair Ruaidh*), who was born in Harris in 1569 or thereabouts, and attained, so tradition relates, to the great age of 105 years; John Macdonald (*Iain Lom*) of the Keppoch family, who witnessed the battle of Inverlochy in 1645, and survived Killiecrankie; Alexander Macdonald (*Mac Mhaighstir Alastair*), the celebrated Jacobite poet, born about 1700, received a university education, became schoolmaster in Ardnamurchan, and afterwards an officer in Prince Charles Stuart's army, published a Gaelic vocabulary in 1741, and a volume of poems in 1751; John MacCodrum, a native of North Uist; Robert Mackay (*Rob Donn*, 1714–78), the Reay Country bard; Dugald Buchannan of Rannoch (1716–68), religious poet and evangelist; Duncan Ban M'Intyre (1724–1812), the famous poet-game keeper of *Beinn-dòrain*, fought at Falkirk in 1746, and in his old age was a member of the city guard of Edinburgh; William Ross (1762–90), schoolmaster in Gairloch; Allan MacDougall (*Ailean Dall*, 1750–1829); Ewan M'Lachlan of Aberdeen (1775–1822), scholar and poet; and William Livingstone (1808–1870), the Islay bard. Of quite recent Gaelic poets may be mentioned, among others, the veteran Evan M'Coll of Kingston, Canada; John Campbell of Ledaig; Mrs Mary Mackellar; and Neil Macleod. Of late years the most notable Gaelic works published have been *The Beauties of Gaelic Poetry*, edited by John Mackenzie; *Caraid nan Gaidheal*, being a selection of dialogues and articles contributed by Dr Norman Macleod the elder, the best of Gaelic prose writers, to several periodicals and books; J. F. Campbell's *Tales of the West Highlands* (4 vols. 1860–62), and the same author's *Leabhar na Feinne* or 'Ossianic Ballads' (1872); the *Book of the Dean of Lismore*, edited by Drs M'Lauchlan and Skene (1862); and Sheriff Nicolson's *Gaelic Proverbs* (1881). Scholarly clergymen of a past generation—the Stewarts of Killin, Luss, and Dingwall, and Dr Smith of Campbeltown—made an excellent translation of the Scriptures into Gaelic. The grammars of Stewart and Munro, and the dictionaries of Armstrong (1825) and the Highland Society (1828), though requiring to be rewritten in the light of modern science, are works of great merit. Among the most prominent of recent scholars in the field of Scottish Gaelic were Dr Thomas M'Lauchlan of Edinburgh, Dr Archibald Clerk of Kilmallie, and Dr Alexander Cameron of Brodick. See CELTS, PICTS, OSSIAN, IRELAND, DELL.

Gaeta (Lat. *Caieta*), a strongly fortified maritime town of southern Italy, in the province of Caserta, is picturesquely situated on a lofty promontory projecting into the Mediterranean, 50 miles NW. of Naples. On the summit of the promontory stands the circular Roland's tower, said to be the mausoleum of Lucius Munatius Plancus, the friend of Augustus. The beauty of the bay of Gaeta, which almost rivals that of Naples, has been celebrated by Virgil and Horace. On the dismemberment of the Roman empire, Gaeta became an independent centre of civilisation and commercial prosperity. The town has been besieged on several occasions, as by Alphonso V. of Aragon in 1435, by the Austrians in 1707, by Charles of Naples in 1734, by the French in 1806, by the Austrians in 1815, and by the Italian national party in 1861. In 1848–49 it was the

refuge of Pope Pius IX.; in 1860–61 of Francis II. of Naples. The vicinity of Gaeta abounds in remains of Roman villas, &c. The citadel, which is of great strength, contains in its tower the tomb of the Constable Bourbon, killed at the taking of Rome in 1527. The inhabitants, 16,848 in 1881, are chiefly engaged in fishing and in the coasting trade in corn, oil, wine, and fruits.

Gaeta, Mola di. See Formia.

Gætulia, an ancient country of Africa, situated south of Mauritania and Numidia, and embracing the western part of the Sahara. Its inhabitants belonged in all probability to the aboriginal Berber family of north and north-western Africa; they were not in general black, though a portion of them dwelling in the extreme south, towards the Niger, had approximated to this colour through intermixture with the natives and from climatic causes, and were called *Melanogætuli*, or 'Black Gætulians.' The Gætulians were savage and warlike, and paid great attention to the rearing of horses. They first came into collision with the Romans during the Jugurthine war, when they served as light-horse in the army of the Numidian king. Cossus Lentulus broke them to Roman rule, obtaining for his success a triumph and the surname of Gætulicus (6 A.D.). The ancient Gætulians are believed to be represented by the modern Tuareg.

Gaff, in a ship or boat, the spar to which the head of a fore-and-aft sail is bent, such sail having its foremost side made fast by rings to the mast, and its lower edge, in most instances, held straight by a boom. The thick end of the gaff is constructed with 'jaws' to pass half round the mast, the other half being enclosed by a rope. A gaff-topsail is a small sail carried on the topmast above the gaff.—For the gaff or hook of the fisherman, see Angling.

Gage. See Gauge; and for Greengage, see Plum.

Gage, Thomas, an English general, was born in 1721, the second son of the first Viscount Gage. In 1755 he accompanied Braddock's ill-fated expedition as lieutenant-colonel, and as brigadier-general became in 1760 military governor of Montreal, and in 1763 commander-in-chief of the British forces in America. His inflexible character led the government to regard him as well fitted to end the disturbances in the American colonies. In 1774 he was nominated governor of Massachusetts, a post of peculiar difficulty, and his enforcement of the rigorous decrees of parliament brought matters to a climax. On the night of 18th April 1775 he despatched an expedition to seize a quantity of arms which had been stored at Concord; and next day took place the memorable encounter of Lexington, which announced that the Revolution had begun. The battle of Bunker Hill (q.v.) made him unpopular. For a short time he was commander-in-chief in America, a post he soon resigned to return to England, where he died, 2d April 1787. One of his sons became third viscount.

Gagern, Heinrich Wilhelm August, Freiherr von, German statesman, was born at Baireuth, 20th August 1799. He was one of the founders of the student movement (*Burschenschaft*) of 1815–19. After holding office under the government of Hesse-Darmstadt down to 1848, he became, in that year, one of the leading politicians of the Frankfort parliament, of which he was elected president. In that capacity he endeavoured to carry his views that the new central government for all Germany should be established on the basis of monarchical constitutionalism, and that the king of Prussia was the most fitting monarch to be elected to the dignity of emperor. But, discouraged by the lukewarmness of Prussia, and repelled by the violence of the extreme democratic party, Gagern resigned his position, 20th May 1849, and shortly afterwards retired into private life. But from 1859 he again took part in the grand-ducal politics, as a strong partisan of Austria against Prussia. Pensioned off in 1872, he died at Darmstadt, 22d May 1880.

Gaillac, a town in the French department of Tarn, on the river Gaillac, 32 miles by rail NE. of Toulouse. The abbey church of St Michel dates from the 12th century. Its 6368 inhabitants are engaged in wine-growing, coopering, and spinning, and trade in clover, coriander seeds, plums, and wine.

Gaillard, Château. See Andelys.

Gainsborough, a market-town of Lincolnshire, on the right bank of the Trent, 21 miles above its embouchure in the Humber, and 16 miles by rail NW. of Lincoln. The parish church, with the exception of a fine old tower, dating from the 12th century, was rebuilt in 1736. The Manor House, built by John of Gaunt, now forms part of the corn exchange. The grammar-school was founded in 1589. Vessels drawing 12 feet of water can ascend the Trent to Gainsborough, which ranks as a sub-port of Grimsby. The town manufactures linseed cake and oil, malt, cordage, and machinery. Pop. (1851) 7506; (1891) 14,372. See the history by Stark (2d ed. 1843).

Gainsborough, Thomas, portrait and landscape painter, one of the greatest of English artists, was born at Sudbury, Suffolk, in 1727, the day of his baptism being the 14th of May. His father, a well-to-do clothier and crapemaker, had him educated at the grammar-school of the place, where Mr Burroughs, the boy's uncle, was master; and, as he was never happy but when sketching the rustic scenery around him, he was sent to London, at the age of fourteen, to study art under Gravelot, the excellent French engraver and designer of book-illustrations, under Frank Hayman, and in the St Martin's Lane Academy. He returned to his native county about 1744, established himself as a portrait-painter at Ipswich, and in 1745 married Margaret Burr, a lady with £200 a year. He was patronised by Sir Philip Thicknesse, the governor of Landguard Fort, a view of which, afterwards engraved by Major, he was commissioned to paint. Through the advice of his friend, he removed in 1760 to Bath, where Thicknesse had influence, and where there was a promising opening for a skilful portrait-painter. Here he won the public by his portrait of Earl Nugent; numerous commissions followed, and in 1761 he began to exhibit with the Society of Artists of Great Britain, in Spring Gardens, London, a body which he continued to support till 1768, when he became a foundation member of the Royal Academy, from which he afterwards practically retired, owing to what he considered the unworthy place that had been assigned to his group of 'The King's Daughters' in the exhibition of 1784. In 1774, after a deadly quarrel with Thicknesse, he removed to London, establishing his studio in a portion of Schomberg House, Pall Mall, and there prosecuted his art with splendid success, being in portraiture the only worthy rival of Reynolds, and in landscape of Wilson. In 1788, while attending the trial of Warren Hastings, in Westminster Hall, he caught a chill from an open window, a cancerous tumour developed itself, and he died on the 2d of August, and was buried in Kew churchyard. Personally, Gainsborough possessed all the enthusiasm, the airy vivacity, the hot impulsiveness, that we commonly associate with the artistic temperament. He was devoted

to art in every form. Fond of company, he loved to associate with players and musicians; he was himself a performer on various instruments, and for him Garrick was 'the greatest creature living, in every respect, worth studying in every action.' Quick of temper, he was also right generous both of hand and heart; and when the long estranged Reynolds visited him on his death bed, Gainsborough parted from him with the often-quoted words of perfect brotherhood: 'We are all going to heaven, and Van Dyck is of the company.'

The art of Gainsborough, compared with that of his great contemporary Reynolds, is less scholarly and more instinctive; his portraits show less deep insight into character than those of his rival, but they have perhaps even more of grace, give perhaps even more vivid glimpses of the shifting gesture and expression of the moment. Gainsborough never studied abroad, never left his native country; and though, at various times, he copied from Rubens, Teniers, Vandyke, and Rembrandt, he did so with no merely imitative aim. Nature herself was always before his eye, and nature he interpreted in a manner most individual. His earlier works are firmly and directly handled, with definite combinations of positive colouring; but as his art gained in power he sought more and more for harmony of total effect, for gradation and play of subtly interwoven hues; painting his flesh thinly, but with great certainty of touch, with exquisite refinement of modelling, and with the most delicate transparency in the shadows; and relieving it by the shifting sheen of his draperies, and by backgrounds of swiftly struck, loosely touched foliage, and of softly blending tints of sky. While his landscapes were unduly preferred to his portraits by the—perhaps not unprejudiced—judgment of Reynolds, they too possess admirable artistic qualities, in their freedom of handling and harmony of colour and effect. Though, as Mr Ruskin has truly noted, they are 'rather motives of feeling and colour than earnest studies,' they have still value as faithful records of a distinctly personal impression of nature; and while Richard Wilson developed with delicate skill the traditions of Claude, Gainsborough may, in some sense, be regarded as the forerunner of Constable, as the founder of the freer and more individual landscape art of our own time.

Gainsborough is excellently represented in the National Gallery, London, by fourteen works, including portraits of 'Mrs Siddons,' of 'Orpin the Parish Clerk,' and of 'Ralph Schomberg, M.P.,' and 'The Market Cart,' and 'The Watering-place;' in the National Portrait Gallery, London, by five works; in the Dulwich Gallery by six works, including the portraits of 'Mrs Sheridan' and 'Mrs Tickell;' and in the National Gallery of Scotland by the portrait of the 'Hon. Mrs Graham.' An exhibition of over 200 of his works was held in London in 1885. 'The Market Cart' fetched 4500 guineas in 1894. 'The Countess of Mulgrave,' sold in 1880 for £1000, brought £10,000 in 1895.

See Life by Fulcher (1856), Wedmore's *Studies* (1876), Brock Arnold's *Gainsborough and Constable* (1881), the *Catalogue* by Horne (1891), Armstrong's *Portfolio* monograph (1898), and the book by Mrs Bell (1897).

Gairdner, Sir William Tennant, K.C.B., was born in 1824, son of Dr John Gairdner (1790–1876), and nephew of William Gairdner (1793–1867), both of whom were born near Ayr and studied in Edinburgh—the latter (who wrote on gout) settling in London. He graduated M.D. at Edinburgh in 1845, becoming F.R.C.P. in 1850, and afterwards LL.D. of Edinburgh, and in 1898 K.C.B. From 1862 till his retirement in 1900 he occupied the chair of Practice of Medicine in Glasgow University, was President of the Medical Association there in 1888, and is physician in ordinary to the Queen for Scotland. He has contributed many valuable papers to the special medical journals, and was an esteemed contributor to the first edition of this Encyclopædia. Among his books are *Pathological Anatomy of Bronchitis and Diseases of the Lungs* (1850), *Notes on Pericardites* (1861), *Clinical Medicine* (1862), *Public Health in relation to Air and Water* (1862), *On some Modern Aspects of Insanity, Lectures to Practitioners* (in conjunction with Dr J. Coats, 1888), *The Physician as Naturalist* (1889).—James Gairdner, historian, a brother of the foregoing, was born at Edinburgh, March 22, 1828, attended lectures in the university there, and at eighteen as a clerk entered the Public Record office in London, where he became assistant-keeper in 1859. He has distinguished himself by the rare combination of profound erudition, patient accuracy, and judicial temper which he has shown in the editing of a long series of historical documents: *Memorials of Henry the Seventh* (1858); *Letters and Papers illustrative of the Reigns of Richard III. and Henry VII.* (2 vols. 1861-63), in the Rolls series; the continuation from vol. v. onwards of the late Professor Brewer's *Calendar of Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII.* (9 vols. 1862-86); and *Historical Collections of a London Citizen* (1876), and *Three Fifteenth-Century Chronicles* (1880), for the Camden Society series. Equally valuable are the books addressed to a wider audience: an edition of the *Paston Letters* in Professor Arber's series (3 vols. 1872-75); *The Houses of Lancaster and York*, in 'Epochs of Modern History' (1874); the *Life and Reign of Richard III.* (1878); *England* in 'Early Chroniclers of Europe' (1879); *Studies in English History* (1881), a series of essays written in conjunction with Spedding; and *Henry VII.* ('Statesmen' series, 1889). He was made C.B. in 1900.

Gairloch, an inlet of the sea on the west coast of Ross-shire, 6 miles in length, which gives name to a parish and village. See J. H. Dixon, *The Gairloch* (1888).

Gaisford, Thomas, D.D., a distinguished classical scholar, was born in 1780 at Ilford, Wilts. He graduated at Christ Church, Oxford, in 1804. He published an elaborate edition of the *Enchiridion* of Hephæstion, was public examiner 1809-10, and in 1811 was appointed regius professor of Greek at Oxford. From 1819 to 1847 he was rector of Westwell, Oxfordshire. In 1831 he became dean of Christ Church. He died in 1855, and in his memory a Greek prize was founded at Oxford. Among his classical publications are an edition of the *Lexicon of Suidas* (1834), and the *Etymologicon Magnum* (1848).

Gaius, a Roman jurist, who flourished between 130 and 180 A.D. Of his personal history next to nothing is known. Before the revision of the Roman laws, and the reform of legal studies by Justinian, the *Institutes* of Gaius, as well as four other of his treatises, were the received text-books of the schools of law. His *Institutes*, moreover, formed the groundwork of the *Institutes* of Justinian. The other works of Gaius, of which we have little more than the titles, were largely used in the compilation of the *Digest*, which contains no fewer than 535 extracts from his writings. The *Institutes* was, like the others, almost completely lost, until in 1816 Niebuhr discovered it at Verona, under a palimpsest of the *Epistles* of Jerome. This discovery threw a flood of light upon the history of the early development of Roman law, especially upon the forms of procedure in civil actions. The first book treated of status and family relations;

the second, of things and of how possession of them may be acquired, including the law relating to wills; the third, of intestate succession and obligations; and the fourth and last, of actions. Alaric II., king of the West Goths, promulgated in 506, for the use of his Roman subjects, the code known as *Breviarium Alarici*, which contains copious excerpts from Gaius. Of numerous editions of the *Institutes* published since 1817, may be mentioned those in fac-simile by Böcking (Leip. 1866) and Studemund (Leip. 1874), and with an English translation by E. Porte (2d ed. Oxford Clarendon Press, 1875) and James Muirhead (Edin. 1880).

Galabat, a small republic of Negroes from Dar-Fûr and Wadai, situated near the western frontiers of Abyssinia. The people, some 20,000 in number, and fanatical Mohammedans, trade with Abyssinia in coffee, cotton, hides, and beeswax.

Galactodendron. See COW-TREE.

Galactometer. See LACTOMETER.

Galacz. See GALATZ.

Galago, a genus of large-eared, long-tailed, African Lemurs (q.v.), arboreal and nocturnal in habit, living on fruit and insects. They vary from the size of a rabbit to that of a rat, are covered with thick soft woolly fur, have somewhat bushy tails longer than the body, and hind-legs longer and stronger than the arms, with two of the ankle bones (*calcaneum* and *navicular*) greatly elongated. The head is round like a cat's; the eyes are large with oval pupils contracting in daylight to vertical slits; the ears are naked and very big, expanded during activity, but rolled together when the animal rests. The digits are strong and well adapted for grasping the branches; all bear nails except the second on the hind-foot, which is clawed. The dentition

Galago Monteiri.

suggests insectivorous rather than vegetarian diet. The female is said to bear one young one at a birth, and often carries it about. Soft nests are also made in the branches. The Galago proper (*G. senegalensis* or *Otolicnus Galago*) is a pretty animal with woolly fur, grayish fawn above, whitish beneath. It seems to be distributed throughout tropical Africa, and is known in Senegal as 'the gum animal' from its frequent habitat in mimosa or gum-acacia forests, and from its alleged habit of gum-chewing. They sleep with bowed head and tail curled round them during the day, but at night they are as active as birds, watching for moths and small animals, on which they spring with great adroitness. They are said to form a favourite article of food in Senegal. The largest species (*G.* or *O. crassicaudatus*) measures a foot in length, not including the bushy tail, which is 15 or 16 inches more. 'In Zanzibar the Komba (*G.* or *O. agisymbanus*) is said frequently to make itself intoxicated with palm-wine, so that it falls from the tree and gets caught.' It is readily tamed and utilised to catch insects and mice in the houses. There are numerous species, sometimes distributed in sub-genera.

Galahad. See GRAIL.

Galangale (*Alpinia galanga*: not to be confused with 'the slender galingale,' see GALINGALE), a genus of Zingiberaceæ cultivated in the Eastern Archipelago, and much used in the East for the same purposes as ginger.

Galanthus. See SNOWDROP.

Galapagos (Span. *Galápagos*, from *galápago*, 'a tortoise'), a group of islands of volcanic formation, lying on the equator, about 600 miles W. of Ecuador, to which they belong. The archipelago derives its name from the enormous land tortoises formerly found there in great numbers; but the individual islands all possess names of English origin—probably bestowed by the buccaneers who made them a sort of headquarters during the 17th century. The group consists of seven principal islands, with about half-a-dozen of lesser size, and innumerable islets and rocks; the area is estimated at 2440 sq. m., of which Albemarle Island embraces over half. Rising to a height of nearly 5000 feet, and with a climate dry and somewhat tempered by the cool Peruvian current, the islands are covered with a dense vegetation on the southern side, which absorbs the moisture carried by the trade-wind; on the northern side they are barren and forbidding in aspect, the lower parts covered entirely with ashes and lava or with prickly scrub. Darwin puts the number of craters in the group at 2000; some appear to be not yet extinct. The Galapagos possess both a flora and fauna peculiar to themselves; over a hundred species of plants have been noted that are met with nowhere else, and the species of animals differ greatly even in the various islands. The archipelago was annexed by Ecuador in 1832, and attempts were made to colonise it, of which the only remaining result is the so-called 'wild cattle.' Charles Island was used as a penal settlement for some years, but it and Chatham Island are now occupied by agricultural colonists, the chief crop being sugar. Cotton, vegetables, and most cereals are also raised, and molasses, rum, hides, and Archil (q.v.) are exported. Pop. (1895) 400. See Darwin's *Voyage of the Beagle*, and a paper by Captain Markham in *Proc. Roy. Geog. Soc.* (1880).

Galashiels, the chief seat in Scotland of the Scotch tweed manufacture, occupies 2½ miles of the narrow valley of the Gala, immediately above the junction of that river with the Tweed. Till 1891 situated partly in Roxburghshire and partly in Selkirkshire, for judicial purposes it had been fixed by an act passed in 1867 as within the county of Selkirk. It is 33½ miles SSE. of Edinburgh, and 4 WNW. of Melrose. In the 15th century it is spoken of as 'the forest-steading of Galashiels;' and its tower, demolished about 1814, was then occupied by the Douglases. In 1599 it was made a burgh of barony, having then 400 inhabitants. As early as 1581 wool was here manufactured into cloth, and in 1790 the value of the cloth so manufactured was £1000. So great, however, has been the progress of the woollen trade of the town during the present century, that in 1890 the estimated value of tweeds manufactured was no less than one million and a quarter sterling. By the Reform Act of 1868 it was made a parliamentary burgh, and along with Hawick and Selkirk sends a member to

parliament. A local act of parliament was obtained in 1876, under which the bounds of the burgh were extended for municipal purposes, and a water-supply introduced. Galashiels' chief claim to notice is its manufacturing enterprise. It has 23 woollen factories containing 120 'setts' of carding engines, with 100,562 spindles. The goods manufactured are almost exclusively the well-known woollen cloth called Scotch tweed. The mills are almost entirely dependent on steam for motive power. The town has also the largest and best-appointed skinnery in Scotland. Its valuation rose from £29,838 in 1872 to £62,667 in 1889. Pop. 1831 (2209); 1861 (6433); (1871) 10,312; (1881) 15,330; (1891) 17,367, of whom 17,252 were within the extended burgh. See T. Craig Brown's *History of Selkirkshire* (1886).

Galata, a suburb of Constantinople (q.v.).

Galatea. See Acis.

Galatia, also Gallo-Græcia, in ancient geography, a country of Asia Minor, separated from Bithynia and Paphlagonia on the N. by the Olympus range (Ala-Dagh) and the river Halys, and bounded on the E. by Pontus, on the S. by Cappadocia and Lycaonia, and on the W. by Phrygia. The country is an elevated plateau, 2000 to 3000 feet above sea-level, consisting for the most part of a rolling grassy region, that affords excellent pasturage for sheep and goats. The western half of Galatia is watered by the Sangarius, whilst the Halys traverses it in the middle and north-east. The climate is one presenting extremes of heat and cold. The boundaries of Galatia have, however, varied at different epochs of history. Originally it formed part of Phrygia. The name Galatia it received from a body of Gauls who, breaking off from the army of Brennus, when that chieftain invaded Greece, entered Asia Minor about 278 B.C., and were finally defeated in a great battle by Attalus, king of Pergamus, in 235, who thereupon compelled them to settle in Galatia. Remaining independent, however, they proved formidable foes to the Romans in the wars of the latter against the kings of Syria; and although subdued by the Roman general Cnæus Manlius in 189, they still continued to govern themselves, latterly under a single king. These Gauls, who became Hellenised shortly after settling in their new country, although they clung to their native language down to the 4th century, extended their power during the 1st century B.C. over Pontus, part of Armenia, Lycaonia, Isauria, and other districts. But on the death of King Amyntas in 25 B.C. the country was made a Roman province, which was further divided by Theodosius the Great into Galatia Prima, with Ancyra (Angora) for its capital, and Galatia Secunda, with Pessinus as chief town.

Galatians, The Epistle to the, an epistle directed by the apostle Paul 'to the churches of Galatia.' According to Lightfoot it was written from Macedonia or Achaia in the winter or spring of the years 57–58 A.D. Others place it at the end of 55 or the beginning of 56, on the apostle's journey to Ephesus or in the early part of his sojourn there. It is one of the most important of the four epistles which are undoubtedly from the hand of Paul, and was written to counteract the influence of the Judaisers who had appeared among the Gentile Christians of the churches of Galatia. Those churches had been founded by Paul during the second, and revisited by him during the third, of his missionary journeys (cf. Acts, xvi. 6, and xviii. 23). At his first visit the people received him as 'an angel of God,' and he was detained among them by sickness for a considerable time. It is disputed whether the passages i. 9, iv. 16–20, and v. 7, 12 show traces of the Judaising leaven even at the time of his second visit, or whether i. 6, iii. 1, and v. 7, 8 are sufficient to prove that they did not appear till after his departure. As the Roman province of Galatia formed in 25 B.C. included also Isauria, Lycaonia, and parts of Pisidia and Phrygia, some think that the 'churches of Galatia' may have extended to those regions, but it is more probable that the Galatia of Paul was confined to the upper basins of the Halys and Sangarius. Barbarian hordes of *Galati* or *Gallograeci* had settled there in the 3d century B.C., and in the larger towns, like Tavium, Pessinus, and Ancyra, adopted Greek speech and manners, while the country people, down to the time of Jerome, spoke a language 'almost identical with that of the Treveri.' Lightfoot concludes from his elaborate investigations that the Galatian settlers belonged to the Cymric branch of the Celtic race. Though the population included also aboriginal Phrygians, as well as Greek, Roman, and Jewish immigrants, the characteristic vitality of the Celts maintained the predominance of that race, whose proverbial impressibility and fickleness are so clearly illustrated in the epistle to the Galatians. The 'troublers' maintained that every one who entered into God's Covenant must be circumcised, and keep the whole law, whose discipline was a moral necessity for all men, and on whose observance the promises of the Old Testament were dependent. Galatians is the only epistle of Paul which has no word of praise for its recipients. It at once plunges passionately into the immediate practical question—why they are 'so soon removed . . . unto another gospel,' and from beginning to end has no tidings, messages, or greetings. The body of the epistle is commonly divided into two parts—(1) theoretical (i. 6—v. 12) and (2) practical (v. 13—vi. 10). Holsten and others prefer the following division of the argument: (1) the divine origin of Paul's gospel proved by a historical demonstration of the impossibility of its opposite (i. 6—ii. 21); (2) the full right of the believing Gentile to the blessing of the Messianic promise proved by a confutation of the assertion that the Messianic salvation is in any way dependent on circumcision and legal observances (iii. 1—iv. 11); (3) the believer's righteousness of life proved to be the fruit or outward expression of the Spirit bestowed upon him—in contradiction of the supposed necessity of a righteousness of life which should be brought about by subjection to circumcision and law (iv. 12—vi. 10).

The chief commentaries on Galatians are those of Luther (1519; Eng. trans. Lond. 1810; Wittenb. 1821; 4th ed. 1859), Ruckert (1833), Schott (1834), De Wette (1841; 3d ed. by W. Moller, 1864; Windischmann (Catholic, 1843), Hilgenfeld (1852), Ellicott (1854; 4th ed. 1867), Jowett (1856), Wieseler (1859), Hofmann (1863; 2d ed. 1872), Lightfoot (1865; 5th ed. 1880), Eadie (1869), Brandes (1869), O. Schmoller (1875), Meyer (6th ed. by F. Sieffert, 1880), Holsten in the *Protestantenbibel* (3d ed. 1879; Eng. trans. by F. H. Jones, 1883; and in *Das Evangelium des Paulus*, vol. i. 1880), Schaff (1884), Wordsworth (1882), Philippi (1884), Kohler (1884), Beet (1885), and Findlay (1888).

Galatina, a town of Italy, 13 miles SW. of Lecce. It has a church, erected in 1384, with antique sculptures and fine tombs of the Balzo-Orsini family. Pop. 8720.

Galatz, or Galacz, a river-port of Moldavia, the centre of the commerce of the Roumanian kingdom, is situated on the left bank of the Danube, 3 miles below the influx of the Sereth, and 85 from the Sulina mouth of the Danube, whilst by rail it is 166 NE. of Bucharest, and 259 SW. of Odessa. It occupies the slope of a hill overlooking the river, and is divided into an Old and New Town, the former consisting of irregularly built streets, the latter built more after the fashion of western Europe. Its dockyard, its large bazaar,

its grain-stores, its magazines of oriental wares, and its banking establishments deserve notice. The chief objects of industry are iron, copper, wax candles, and soap. The exports consist of maize, wheat, wheat-flour, barley, rye, and timber. The imports include timber, grain, fish, fruits, oil, chemicals, iron, steel, and cotton goods. The town has been, since 1856, the seat of the International Danube Commission. The population, a medley of various nationalities, has risen from 36,000 in 1869 to 57,460 in 1895. Galatz has frequently been taken in the wars between the Russians and Turks since 1789. It ceased to be a free port in 1883.

Gala Water, a stream of Edinburgh, Selkirk, and Roxburgh shires, rising among the Moorfoot Hills, and winding 21 miles south-south-eastward, past Stow and Galashiels, till, after a total descent of 800 feet, it falls into the Tweed, a little below Abbotsford, and 2½ miles W. of Melrose. In its valley, the ancient Wedale, Skene localises one of Arthur's battles; its 'braw, braw lads' are famous in song.

Galaxy (Gr. *gala*, 'milk'), or the Milky-way, is the great luminous band which nightly stretches across the heavens from horizon to horizon, and which is found to form a zone very irregular in outline, but completely encircling the whole sphere almost in a great circle, inclined at an angle of 63° to the equinoctial. At one part of its course it opens up into two branches, one faint and interrupted, the other bright and continuous, which do not reunite till after remaining distinct for about 150°. Its luminosity is due to innumerable multitudes of stars, so distant as to be blended in appearance, and only distinguishable by powerful telescopes. How a collection of stars can assume such appearances as are presented in the Galaxy is explained in the article STARS (q.v.). The investigation of this subject was largely the work of Sir William Herschel. The origin of the current figurative use of galaxy, as in 'galaxy of beauty,' 'galaxy of wit,' is sufficiently obvious.

Galba, SERVIUS SULPICIUS, Roman emperor from June 68 A.D. to January 69, was born 24th December 3 B.C. He was raised to the consulship in 33 A.D., and conducted the administration in Aquitania, Germany, Africa, and Hispania Tarraconensis with courage, skill, and strict justice. In 68 the Gallic legions rose against Nero, and proclaimed Galba emperor. But Galba, now an old man, soon made himself unpopular by placing himself in the hands of greedy favourites, by ill-timed severity, and, above all, by his avarice. Shortly afterwards he was assassinated by the praetorians in Rome.

Galbanum, a gum-resin, used in medicine in the same cases as asafœtida. It is met with in hardened drops or tears, usually compacted into a mass, of a brown to light-green translucent colour, and possessing an aromatic odour and bitter alliaceous taste. Galbanum contains about 7 per cent. of volatile oil, besides resin and gum. It is applied as a plaster to indolent swellings, and occasionally administered as a stimulating expectorant, and in amenorrhœa and chronic rheumatism. Although known from earliest times, and used as an incense by the Israelites (Ex. xxx. 34), under the name of *chelbenah*, its source has always been uncertain. There seems to be little doubt, however, that it is obtained from the *Ferula Galbaniflua* and *F. rubricaulis*, umbelliferous plants found in Persia.

Galchas, a collective name given by Ujfalvy to a group of tribes inhabiting the highlands and upland valleys of Ferghana, the Zarafshan, and the Oxus. They are closely akin to the peoples of the Iranic stock, and in speech are near the Tajiks and Persians. They are Sunni Mohammedans.

Galdós, BENITO PEREZ, Spanish novelist, was born in 1849 on the Canary Islands, but settled in Madrid. His earlier works (*Trafalgar*, *Bailen*, &c.) were historical romances: the later ones (*Marianela*, *Leon Roch*, *Lady Perfecta*, &c.) give realistic pictures of social conditions. Many have been translated into English.

Gale, SWEET. See BOG MYRTLE.

Gale, THEOPHILUS (1628–1678), divine, was fellow and tutor of Magdalen College, Oxford, and preacher in Westminster Cathedral; was ejected for nonconformity after 1660, and subsequently was tutor and preacher in London. He wrote *The Court of the Gentiles* (1669), and other works.

Gale, THOMAS (1635?–1702), fellow of Trinity College, Cambridge, head-master of St Paul's and dean of York, edited classics, published *Opuscula* on mythology, and works on early English history.

Galekas, a Bantu tribe, occupy the part of the Transkei Territory (q.v.) just beyond the great Kei River. They are also called Amaxosa Kaffirs.

Galen, or CLAUDIUS GALENUS, a celebrated Greek physician, was born at Pergamus, in Mysia, 131 A.D. In his nineteenth year he began the study of medicine, first at Pergamus, afterwards at Smyrna, Corinth, and Alexandria. On his return to his native city in 158 he was at once appointed physician to the school of gladiators. But six years later he went to Rome, where he stayed for about four years, and gained such a reputation that he was offered, though he declined, the post of physician to the emperor. Scarcely, however, had he returned to his native city when he received a summons from the Emperors M. Aurelius and L. Verus to attend them in the Venetian territory, and shortly afterwards he accompanied or followed them to Rome (170). There he remained several years, though how long is not known precisely: at all events he attended M. Aurelius and his two sons, Commodus and Sextus, and about the end of the 2d century was employed by the Emperor Severus. If the statements of one of his Arabic biographers, Abu-'l Faraj, be correct, he must have died in Sicily about the year 201, though the exact place and date of his death are not known with certainty.

Galen was a voluminous writer not only on medical, but also on philosophical subjects, such as logic, ethics, and grammar. The works that are still extant under his name consist of 83 treatises that are acknowledged to be genuine; 19 whose genuineness has been questioned; 45 undoubtedly spurious; 19 fragments; and 15 commentaries on different works of Hippocrates. His most important anatomical and physiological works are *De Anatomicis Administrationibus*, and *De Usu Partium Corporis Humani*. As an anatomist, he combined with patient skill and sober observation as a practical dissector—of lower animals, not of the human body—accuracy of description and clearness of exposition as a writer. He gathered up all the medical knowledge of his time and fixed it on such a firm foundation of truth that it continued to be, as he left it, the authoritative account of the science for centuries. His physiology does not, according to modern ideas, attain to the same level of scientific excellence as his anatomy. He is still dominated by theoretical notions, especially by the Hippocratic four elements (hot, cold, wet, and dry) and the Hippocratic humours. His therapeutics are also influenced by the same notions, drugs having the same four elemental qualities as the human body; and he was a believer in the principle of curing diseases traceable, according to him, to the maladmixture of the elements, by the use of drugs possessing the oppo-

site elementary qualities. His pathology also was very speculative and imperfect. In his diagnosis and prognosis he laid great stress on the pulse, on which subject he may be considered as the first and greatest authority, for all subsequent writers adopted his system without alteration. He likewise placed great confidence in the doctrine of critical days, which he believed to be influenced by the moon. In materia medica his authority was not so high as that of Dioscorides. Numerous ingredients, many of which were probably inert, enter into most of his prescriptions. He seems to place a more implicit faith in amulets than in medicine, and he is supposed by Cullen to be the originator of the anodyne necklace which was so long famous in England. The subsequent Greek and Roman medical writers were mere compilers from his writings; and as soon as his works were translated (in the 9th century) into Arabic they were at once adopted throughout the East to the exclusion of all others.

GALENICAL, GALENIST, are words having reference to the controversies of the period of the revival of letters, when the authority of Galen was strongly asserted against all innovations, and particularly against the introduction of chemical, or rather alchemical ideas and methods of treatment into medicine. The Galenists adhered to the ancient formulas, in which drugs were prescribed, either in substance or in the form of tinctures and extracts, &c.; while the chemists professed to extract from them the essences or quintessences *quinta essentia*, the *fifth* essence, supposed to be particularly pure, as requiring five processes to extract it)—i.e. substances in small bulk, presumed to contain the whole virtues of the original drugs in a state of extreme concentration, or purified from all gross and pernicious or superfluous matter.

There have been numerous editions of Galen's writings, or parts of them; the most accessible, as well as probably the best, is that of C. G. Kuhn (20 vols. 1821–33). For a general account of his anatomical and physiological knowledge, see Kobl in vol. vi. of *Trans. Provincial Med. and S. Assoc.* (1837); Daremberg, *Des Connaissances de Galien* (Paris, 1841); and the epitome in English by J. R. Coxe (Phila. 1846).

Galena, or LEAD-GLANCE, a mineral which is essentially a sulphide of lead, the proportions being 13·4 sulphur and 86·6 lead; but usually containing a little silver, and sometimes copper, iron, zinc, antimony, or selenium. It has a hardness equal to 2½–3, and a specific gravity of 7·2–7·6. It is of a lead-gray colour, with a metallic lustre, is found massive, or sometimes granular, or crystallised in cubes or octahedrons. It is very easily broken, and its fragments are cubical. It occurs in veins, beds, and imbedded masses, often accompanying other metallic ores, such as zinc-blende, in the older stratified rocks, but most of all in what is known as the carboniferous or mountain-limestone. It is found very abundantly in some parts of Britain, and in many other countries, as in Sweden, Germany, Switzerland, Hungary, France, the United States, &c. Almost all the lead of commerce is obtained from it. It sometimes contains so much silver that the separation of that metal is profitably carried on. The Lead (q.v.) is extracted from it by a very simple process.

Galena, a city of Illinois, on the Fevre River, 6 miles above its junction with the Mississippi, and 133 miles WNW. of Chicago by rail. The river runs here between high limestone bluffs, and the town is built on a series of terraces. It contains a custom-house, and a number of mills, foundries, and furniture factories, and exports a large quantity of lead (mined and smelted in the vicinity) and zinc. Pop. (1880) 6451; (1890) 5635.

Galeri tes (*galerus*, 'a cap'), a genus of fossil sea-urchins, peculiar to and abundant in the Cretaceous System. The generic name, as well as that popularly given to them in the districts where they abound—viz. 'Sugar-loaves,' is descriptive of the elongated and more or less conical shape of their shell. The body in breadth is nearly circular or polygonal. The under surface is entirely flat, and has the mouth placed in its centre, with the vent near the margin. There are five avenues of pores reaching from the mouth to the summit. These fossils are often found silicified. The species figured is one of the most abundant; it has received its specific name from its resemblance to the white caps worn by the priests of Jupiter.

Galerites albogalerus.

Galerius. Galerius Valerius Maximianus, a Roman emperor, was born of humble parentage, near Sardica, in Dacia. Entering the imperial army, he rose rapidly to the highest ranks. In 292 Diocletian conferred on him the title of Cæsar, and gave him his daughter in marriage. In 296–7 he conducted a campaign against the Persians, in which, though not at first successful, he decisively defeated their king, Narses. On the abdication of Diocletian (305) he and Constantius Chlorus became joint-rulers of the Roman empire, Galerius taking the eastern half. When Constantius died at York (306) the troops in Britain and Gaul immediately transferred their allegiance to his son, Constantine (afterwards Constantine the Great). Galerius, however, retained possession of the east till his death in 311. Galerius was a brave soldier and a skilful commander; but he is believed to have forced Diocletian to issue his famous edict of persecution against the Christians.

Galesburg, a city of Illinois, 53 miles WNW. of Peoria by rail, the centre of a rich agricultural district. It has several foundries, machine-shops, and agricultural manufactories, and is the seat of the Lombard University (Universalist, 1857) and of Knox College (Congregational, 1841). Pop. (1860) 4959; (1880) 11,437; (1890) 15,264.

Galesville, a post village of Wisconsin, 15 miles ENE. of Winona, with a Methodist university (1855). Pop. 410.

Galgacus, the name Tacitus gives to the Caledonian chief who offered a desperate resistance to the northward march of Agricola (86 A.D.), and was at length disastrously defeated in the great battle of the Grampians.

Galiani, FERDINANDO, an Italian writer on political economy, was born in Chieti, in the Neapolitan province of Abruzzo Citeriore, on 2d December 1728. Although educated for the church, his favourite studies were philosophy, history, archæology, and more especially political economy. He early gained a reputation as a wit by the publication of a volume parodying, in a series of discourses on the death of the public executioner, the principal Neapolitan writers of the day. About the same time he wrote his first work on political economy, entitled *Della Moneta*, the leading principle of which is that coin is a merchandise, and that its value and interest ought to be left free, as in other goods. His appointment as secretary of legation at Paris in 1759 brought him into contact with the Encyclopædists and the economic writers of that capital. Five years later he published *Dialoghi sul Commercio del Grano* ('Dialogues upon the Trade in Corn'), in which he argues against both the extreme protectionists and the pure free-traders. After his recall to Naples in

1769 he became successively councillor of the tribunal of commerce and (1777) minister of the royal domains. He died at Naples, 30th October 1787. See his *Correspondance* with Mdme. D'Epinay, Holbach, Grimm, Diderot, &c. (1818; new ed. 1881).

Galicia, formerly a kingdom and afterwards a province in the north-west of Spain, bounded N. and W. by the Atlantic, S. by Portugal, and E. by Leon and Asturias, with an area of 11,340 sq. m., has been divided since 1833 into the minor provinces of Coruña, Lugo, Orense, and Pontevedra, whose joint population in 1896 was 1,919,846. The country is mountainous, being traversed by offsets of the Asturian chain, rising in their highest peaks to about 6500 feet. The westernmost spurs, Capes Ortegal and Finisterre, project into the Atlantic. The numerous short but rapid rivers form small estuaries which afford secure havens and roads. The principal river is the Minho, which, with its feeder the Sil, is navigable for small vessels on its lower course. Galicia is one of the most fruitful portions of Europe, and has a mild, nourishing climate; but agriculture is in a backward condition, capital is scarce, roads are bad, and railways are few. Rich meadows and dense forests occur everywhere, but the soil is more suited to the cultivation of garden-produce than of corn. Mines of lead, tin, copper, and iron pyrites are worked. The inhabitants, called Gallegos, are a robust, vigorous, industrious race. Great numbers of them annually visit central and southern Spain and Portugal, where they find employment as harvesters, water-carriers, porters, &c. Chief exports, live cattle, preserved meat, eggs, minerals, fish, fruits, and grain; imports, coal, oil, hides, spirits, sugar, and tobacco. The principal towns are Santiago di Compostella and the two strongly fortified seaports Coruña and Ferrol. Galicia was a kingdom, under the Suevi from 411 to 585, and again from 1060 to 1071, at which date it was finally incorporated with Leon and Castile.

Galicia (Polish *Halicz*), a crown-land belonging to the Austrian monarchy, including the former kingdoms of Galicia and Lodomeria, the duchies of Auschwitz and Zator, and the grand-duchy of Cracow, lies between the Carpathians on the S. and Russian Poland on the N., and between Silesia on the W. and Russia on the E. Area, 30,300 sq. m.; pop. (1890) 6,607,816. With the exception of 230,000 Germans and 770,600 Jews, the inhabitants are of Slavonic race, the western part of Galicia being occupied mainly by Poles, the eastern by Ruthenians. In religion about 2½ millions, mostly Ruthenians, belong to the Greek Church, and nearly 2¾ millions, chiefly Poles, to the Roman Catholic Church. The southern portion of the country is a high terrace, flanking the northern face of the Carpathians. Thence the land slopes away northwards, through a low hilly region, to the deep plains of the Dniester and the Vistula. There are many large rivers—those in the west being feeders of the Vistula, those in the east of the Danube and Dniester. The climate of Galicia is colder than that of any other portion of the Austrian empire, as it is freely exposed to the north and north-east winds. Yearly mean of temperature at Lemberg, 46·4° F.; mean of July, 66·9°; of January, 25·2°; annual rainfall, about 28 inches. The soil is for the most part fertile, and produces oats, rye, and barley in sufficient quantity for export. Wheat, flax, hemp, tobacco, and oil plants are likewise cultivated. Fruit-growing and market-gardening are prosecuted, also bee-keeping. Horses, cattle, and sheep are raised in considerable numbers. Wolves and bears are still found in the mountainous districts. One-fourth of the surface is covered with forests, which yield large quantities of timber for export. Salt is the most important mineral. But coal, iron ore, sulphur, lead, zinc, and petroleum are also extracted. The annual product of the petroleum springs is about 90,000 tons. There are about thirty-five mineral springs, most of them containing sulphur. The industries are few, and, except the manufacture of cloth and the distilling of brandy and of petroleum, not important. Trade, however, chiefly in the hands of the Jews, is pretty active. Lemberg and Cracow, the principal towns, have each a university; the former is the capital of the crown-land. Galicia is ruled by an Austrian governor and an independent diet; to the imperial diet it sends sixty-three members. Galicia takes its name from the old fortress and town of Halicz, on the Dniester. The original Slavonic inhabitants, the Ruthenes, were in the 9th century conquered by the Russians of Kieff. The western portion of the country was dependent on Poland, and afterwards on Hungary. In 1382 it was definitely restored to Poland, and continued to belong to that country till the partition of 1772, when Galicia became one of the crown-lands of Austria. In 1846 Cracow, with the territory belonging to it, was given up to the emperor of Austria, and by him (1849) annexed to the crown-land of Galicia.

Galicz. See HALICZ.

Galignani, JOHN ANTHONY and WILLIAM, Parisian publishers, were born in London, the former 13th October 1796, the latter 10th March 1798. Their father, an Italian, founded an English library at Paris in 1800, and there published an English *Monthly Repertory*, and in 1814 the famous newspaper, *Galignani's Messenger*. The *Messenger* was much improved by his sons, who made it an important medium for advocating cordiality between England and France. The brothers founded at Corbeil near Paris a hospital for distressed Englishmen; and in 1889 the Galignani Home for decayed members of the printing and bookselling trades was opened at Neuilly. The elder brother died 30th December 1873, and the younger 12th December 1882.

Galilee (Heb. *Galil*, a 'circle' or 'circuit'), a name latterly applied to one of the four Roman divisions of Palestine, originally referred only to a district of the tribe of Naphtali. In the time of our Lord, Galilee embraced the whole northern portion of Palestine from the Mediterranean to the Jordan. The district was divided into Upper and Lower Galilee, the former being hilly and well wooded, the latter level and very fertile. At that time it was mainly inhabited by Syrians, Phœnicians, Arabs, and Greeks, with a few Jews. The principal towns were Tiberias and Sepphoris; those that figure in the gospels are Cana, Capernaum, Nazareth, and Nain. The Jewish inhabitants were held in low estimation by their brethren in Judæa, on account of their less rigid sentiments in regard to religion. After the destruction of Jerusalem the despised Galilee became the refuge of the proud doctors of Jewish law, and the city of Tiberias the seat of Rabbinical learning. The ruins of many fine synagogues are still extant in this region. Galilee now forms part of the pashalic of Damascus, in the Turkish province of Syria, and, as of yore, is remarkable for its beauty and fertility. It still has a considerable number of Jewish inhabitants. See Dr S. Merrill, *Galilee in the Time of Christ* (new ed. 1885).

The SEA OF GALILEE, called also in the New Testament the *Lake of Gennesaret* and the *Sea of Tiberias*, and in the Old Testament the *Sea of Chinnereth* or *Cinneroth*, a large lake in the northern half of Palestine. Lying 682 feet below sea-level,

it is 13 miles long by 6 broad, and 820 feet deep. It occupies the bottom of a great basin, and is undoubtedly of volcanic origin. Although the Jordan runs into it red and turbid from the north, and many warm and brackish springs also find their way thither, its waters are cool, clear, and sweet. Its shores on the east and north sides are bare and rocky; on the west sloping gradually, and luxuriantly covered with vegetation. The surrounding scenery is hardly beautiful, but its associations are the most sacred in the world. It is enough to mention the names of some of the towns on its shores, Bethsaida, Capernaum, Magdala, and Tiberias. In the time of Jesus the region round about was the most densely populated in Galilee; now even its fisheries are almost entirely neglected.

Galilee, the name applied to a porch or chapel attached to a church, in which penitents stood, processions were formed, and corpses deposited for a time previous to interment. In some religious houses the galilee was the only part of the church accessible to women; the monks came to the galilee to see their female relatives—the women being told in the words of Scripture, 'He goeth before you into Galilee; there shall you see him' (Matt. xxviii. 7). A portion of the nave was sometimes marked off by a step, or, as at Durham, by a line of blue marble, to mark the boundary to which women were limited. There are galilees in the cathedrals of Lincoln (on west side of south transept), Ely (at west end of nave), and Durham (west end of nave).

Galile'i, GALILE'O, one of the fathers of experimental science, was born at Pisa on the 18th of February 1564. By the desire of his father, the descendant of an ancient Florentine family, Galileo directed his early studies to medicine, and of course the prevailing Aristotelian philosophy; but the dogmas of this last he soon ventured to disbelieve and despise. Entering the university of Pisa in 1581, he made there two years later one of his most important discoveries. Happening to observe the oscillations of a bronze lamp in the cathedral of Pisa, he was struck with the fact that the oscillations, no matter what their range, seemed to be accomplished in equal times. The correctness of this observation he at once proceeded to test, and then, comparing the beat of his own pulse with the action of the pendulum, he concluded that by means of this equality of oscillation the simple pendulum might be made an invaluable agent in the exact measurement of time, a discovery which he utilised some fifty years later in the construction of an astronomical clock. About this time his irrepressible bias towards mechanical constructions and experimental science received a new impulse from his introduction to the principles of mathematics. The first fruit of his ardent pursuits of the new studies was the invention of a hydrostatic balance and the composition of a treatise on the specific gravity of solid bodies. These achievements secured him the appointment of professor of Mathematics in the university of Pisa, where he propounded the novel theorem, that all falling bodies, great or small, descend with equal velocity, and proved its correctness by several experiments made from the summit of the leaning tower of Pisa. This provoked the enmity of the Aristotelians, whose bitterness was exacerbated by the cutting sarcasms of the successful demonstrator. Nevertheless Galileo in 1591 deemed it prudent to resign his chair at Pisa, and retire to Florence, though another cause has been assigned for his resignation—viz. that he ridiculed the mechanical pretensions of Giovanni de' Medici, son of Cosmo I.

In the following year he was nominated to the chair of Mathematics in the university of Padua, where his lectures attracted crowds of pupils from all parts of Europe. Here he taught and worked for eighteen years, from 1592 to 1610. It may be remarked parenthetically that he was the first to adapt the Italian idiom to philosophical instruction. Among the various discoveries with which he enriched science may be noticed a species of thermometer, a proportional compass or sector, and, more important than all, the refracting telescope for astronomical investigation. This last, however, he seems not to have invented entirely independently: an account of an instrument for enlarging distant objects, invented by a Dutchman, seems to have reached him whilst on a visit to Venice in May 1609; thereupon setting his inventive wits to work, he constructed an apparatus involving the principles of the telescope. Rapidly improving the construction of his original instrument, Galileo now began a series of astronomical investigations, all of which tended to convince him still more of the correctness of the Copernican heliocentric theory of the heavens, of the truth of which he seems indeed to have been early persuaded. He concluded that the moon, instead of being a self-luminous and perfectly smooth sphere, owed her illumination to reflection, and that she presented an unequal surface, diversified by valleys and mountains. The Milky-way he pronounced a track of countless separate stars. Still more important, however, was the series of observations which led to the discovery of the four satellites of Jupiter on the night of the 7th of January 1610 (though it was not till the 13th of the same month that he came to the conclusion that they were satellites, and not fixed stars), which he named the Medicean stars, in honour of his protectors, the Medici family. He also first noticed movable spots on the disc of the sun, from which he inferred the rotation of that orb. In this year he was recalled to Florence by the Grand-duke of Tuscany, who nominated him his philosopher and mathematician extraordinary, gave him a good salary, and exacted from him no duties save those of prosecuting his scientific investigations untrammelled. At Florence, continuing his astronomical observations, he discovered the triple form of Saturn and the phases of Venus and of Mars.

In 1611 Galileo visited Rome and was received with great distinction, being enrolled a member of the Lincei Academy. Yet the publication, two years later, of his *Dissertation on the Solar Spots*, in which he openly and boldly professed his adhesion to the Copernican view, provoked against him the censure and warning of the ecclesiastical authorities. But this he partly brought upon himself by his aggressive attitude towards the champions of orthodoxy and even towards the Scriptures, whose astronomical system he hesitated not to challenge. Galileo, however, promised (26th February 1616) to obey Pope Paul V.'s injunction, thenceforward not to 'hold, teach, or defend' the condemned doctrines. After that he seems to have been again taken into favour by the pope and other high dignitaries of the church; indeed personally he seems never to have lost their esteem. But in 1632, ignoring his pledge, he published the *Dialogo sopra i due massimi Sistemi del Mondo*, a work written in the form of a dialogue between three fictitious interlocutors, the one in favour of the Copernican system, the second an advocate of the Ptolemaic, and the third a well-meaning but stupid supporter of the Aristotelian school. Hardly had the work been issued when it was given over to the jurisdiction of the Inquisition. Pope Urban VIII., previously Cardinal Barberini, a friend and admirer of Galileo, was led to believe that Galileo had satirised him in this work in the person of the third inter-

locutor, as one who was careless about scientific truth, and who timidly adhered to the rigid traditions of antiquity. In spite of his seventy years and heavy infirmities Galileo was summoned before the Inquisition, and, after a wearisome trial and incarceration, was condemned to abjure by oath on his knees the truths of his scientific creed. Since the year 1761 a legend has been current to the effect that on concluding his recantation he exclaimed, *sotto voce*, 'E pur si muove' (Nevertheless it does move). The question whether he was put to the torture or no has given rise to a keen controversy, in which neither side can justly claim to have offered evidence that is finally conclusive. He was certainly subjected to the *examen rigorosum*, the last stage of which is actual torture. But the official accounts of the trial make no mention of this last stage having been reached. On the other hand, it has been asserted that the records of his trial have been tampered with. Galileo was further sentenced to an indefinite term of imprisonment in the dungeons of the Inquisition; but this was commuted by Pope Urban, at the request of Ferdinand, Duke of Tuscany, into permission to reside at Siena, and finally at Florence. In his retreat at Arcetri, near Florence, he continued with unflagging ardour his learned researches, even when hearing grew enfeebled and sight was extinguished. Just before he became totally blind, in 1637, he made yet another astronomical discovery, that of the moon's monthly and annual librations. He died on the 8th of January 1642, and was interred in the church of Santa Croce, the pantheon of Florence. His disposition was genial; he enjoyed the social wit and banter of his chosen friends; and the readiness with which he offered or accepted atonement modified a somewhat irascible disposition. The great deficiencies in his character were a want of tact to keep out of difficulties, and a want of moral courage to defend himself when involved in them. His biting satirical tongue, more than his physical discoveries, was the cause of his misfortunes. He loved art, and cultivated especially music and poetry. Ariosto he knew almost by heart, and appreciated keenly the beauties of this classic. Tasso, on the other hand, he unduly depreciated, and severely criticised him in *Considerazioni al Tasso*. His own style is nervous, flowing, and elegant. In addition to the discoveries and inventions already recorded we owe to the genius of Galileo the formulation of the law of uniformly accelerated motion in the case of bodies falling freely towards the earth, the determination of the parabolic path of projectiles, the theory of virtual velocities, and the law that all bodies, even invisible ones like air, have weight. The best edition of Galileo's collected works is that by Alberi (16 vols. Flor. 1842–56).

See Viviani's *Life of Galileo* (1654); Henri Martin's *Galilée* (1868); H. de l'Epinois in *Revue des Questions Historiques* (1867), and *Les Pièces du Procès de Galilée* (1877); Gebler, *Galileo und die Römische Curie* (1876); Berti, *Copernico e Sistema Copernicano*, and *Il Processo Originale di Galileo* (1876); Wohlwill, *Ist Galilei gefoltert worden?* (1877); Favaro, *Galileo Galilei* (2 vols. Flor. 1882); Wegg-Prosser, *Galileo and his Judges* (1889).

Galingale, a name often applied to the tubers of *Cyperus longus*, and sometimes to the whole plant. The tubers are of ancient medicinal repute, and are sometimes still eaten as a vegetable in Greece. See CYPERUS.

Galion, a town of Crawford county, Ohio, at the junction of several railways, 58 miles N. by E. of Columbus, with several cigar-factories and machine-shops, two railroad-shops, and a foundry. Pop. 5635.

Galipea. See ANGOSTURA BARK.

Galitzin, also GALLITZIN, GALYZIN, or GOLYZIN, one of the most powerful and distinguished Russian families, whose members, too numerous to catalogue, have been equally prominent in war and diplomacy from the 16th century downwards.—VASILI, surnamed the Great, born in 1643, was the councillor and favourite of Sophia, the sister of Peter the Great, and regent during his minority. His great aim was to bring Russia into contact with the west of Europe, and to encourage the arts and sciences in Russia. His design to marry Sophia, and plant himself on the Russian throne, miscarried. Sophia was placed by her brother in a convent, and Vasili banished (1689) to a spot on the Frozen Ocean, where in 1714 he died.—DIMITRI (1735—1803), Russian ambassador to France and Holland and intimate friend of Voltaire and Diderot, and the Encyclopædists, owes the preservation of his name mainly to his wife, the celebrated AMALIE, PRINCESS GALITZIN (1746–1806), daughter of the Prussian general, Count von Schmettau. She was remarkable for her literary culture, her grace and amiability of disposition, her sympathetic relations with scholars and poets, but, above all, for her ardent piety, which found in Catholicism its most congenial sphere. Having separated from her husband, she took up her residence in Münster, where she gathered round her a circle of learned companions, including for a longer or shorter time Jacobi, Hemsterhuis, Hamann, and Count Stolberg.—DIMITRI AUGUSTINE, son of the foregoing, was born at the Hague, December 22, 1770. He became a Roman Catholic in his seventeenth year; and, through the influence exercised over him by a clerical tutor during a voyage to America, he resolved to devote himself to the priesthood. In 1795 he was ordained a priest in the United States by Bishop Carroll of Baltimore, and betook himself to a bleak region among the Alleghany Mountains, in Pennsylvania, where he was known as 'Father Smith' (Smith being originally a corruption of Schmettau). Here he laid the foundation of a town, called Loretto, where he died 6th May 1841. He declined to return to Russia on his father's death, and as a Catholic priest was adjudged to have lost his right of inheritance. He was for some years vicar-general of the diocese of Philadelphia. He was austere in his mode of life, but liberal in the highest degree to others, and an affectionate and indefatigable pastor. He wrote various controversial works, including a *Defence of Catholic Principles* (1816), *Letter to a Protestant Friend* (1820), and *Appeal to the Protestant Public* (1834). See the Lives by Heyden and by Brownson.

Galium. See BEDSTRAW.

Gall. A synonym for Bile (q.v.), the secretion of the Liver (q.v.). See also GALLS.

Gall, FRANZ JOSEPH, the founder of phrenology, was born at Tiefenbronn, near Pforzheim, on the borders of Baden and Würtemberg, 9th March 1758. He studied medicine at Strasburg and Vienna, and settled in the latter city in 1785 as a physician. From his boyhood he had been attracted by the problems arising out of the relations between the powers of mind, the functions of the brain, and the external characters of the cranium. In 1796 he began to give courses of lectures on Phrenology (q.v.) in Vienna; but the lectures were prohibited in 1802 by the Austrian government as being subversive of the accepted religion. Along with Spurzheim (q.v.), who became his associate in 1804, Gall quitted Vienna in 1805, and began a lecturing tour through Germany, Holland, Sweden, and Switzerland. He reached the height of his fame when in 1807 he settled as a physician in Paris. On 14th March 1808 he and

Spurzheim presented to the Institute of France a memoir of their discoveries, on which a committee of the members of that body (including Pinel, Portal, and Cuvier) drew up an unfavourable *Report*. Thereupon Gall and Spurzheim published their memoir, *Introduction au Cours de Physiologie du Cerveau*; this was subsequently followed by *Recherches sur le Système Nerveux* (1809), and by *Anatomie et Physiologie du Système Nerveux* (4 vols. 1810-19), with an atlas of 100 plates. But, the two phrenologists having parted in 1813, the name of Gall alone is prefixed to vols. 3 and 4; and it alone is borne by a reprint of the physiological portion of the work, entitled *Sur les Fonctions du Cerveau, et sur celles de chacune de ses Parties* (6 vols. 1825). In 1811, in answer to accusations of materialism and fatalism brought against his system, Gall published *Des Dispositions Innées de l'Ame et de l'Esprit*. He continued to practise medicine and pursue his researches at Montrouge, near Paris, till his death, 22d August 1828.

Gall, St. See ST GALL.

Gallait, Louis, a Belgian historical painter, was born at Tournay in 1812, and made himself famous by pictures on subjects from the history of the Low Countries, such as 'The Abdication of Charles V.' (1841), 'Alva viewing the dead bodies of Egmont and Horn' (1851), and 'The Plague of Tournay' (1882), which last the Brussels Museum purchased for £4800. He died 18th November 1887.

Galland, Antoine, a French orientalist and archæologist, was born 4th April 1646, at Rollot, near Montdidier, in Picardy. Attached in 1670 to the French embassy at Constantinople, he three years later accompanied the ambassador De Nointel to Syria and the Levant. In 1676, and again in 1679, he made other visits to the East, where he gathered valuable collections of antiquities, and acquired a good knowledge of oriental languages. In 1701 he was made a member of the Académie des Inscriptions, and in 1709 professor of Arabic in the Collège de France. He died at Paris, 19th February 1715. The greatest part of Galland's writings relate to archæological subjects, especially to the numismatics of the East; but the work which has secured him the greatest reputation is his translation of the *Arabian Nights* in 12 vols. (*Les Mille et Une Nuits*, Paris, 1704-8), the first translation of these stories made into any language of Christendom (see ARABIAN NIGHTS). Among his other writings we may mention *Paroles Remarquables, Bons Mots, et Maximes des Orientaux* (1694), and *Les Contes et Fables Indiennes de Bidpai et de Lokman* (2 vols. 1724). See also *Journal d'Antoine Galland pendant son séjour à Constantinople, 1672-73*, edited by Ch. Schefer (2 vols. 1881).

Galla Ox, or SANGA, a remarkable species or variety of ox inhabiting Abyssinia. The chief peculiarity is the extraordinary size of the horns, which rise from the forehead with an outward and then an inward curve, producing a very perfect figure of a lyre, and finally curve a little outwards at the tip, to which they taper gradually.

Gallas, a race of people inhabiting that part of Africa which lies to the south and west of Harar and south of Shoa, between 9° and 3° S. lat. and 34° and 44° E. long. Their racial affinities are not yet conclusively settled; the best authorities regard them as belonging to the Ethiopic branch of the Hamites, and their language as a descendant of the ancient Geez of Abyssinia. Individually they are of average stature, with strong, well-made limbs, skin of a light chocolate brown, hair frizzled but not woolly. Though cruel in war, they are of frank disposition, and faithfully keep their promises and obligations. They are distinguished for their energy, both physical and mental, especially those tribes, to the south and south-west, which pursue pastoral avocations, notably the breeding of horses, asses, sheep, cattle, and camels, and those which live by hunting, especially the elephant. These same tribes are mostly still heathens, though Mohammedanism is rapidly making way amongst them. The more northerly tribes who dwell about Harar profess a crass form of Christianity, derived from Abyssinia, and for the most part practise agriculture, raising cotton, durra, sugar, and coffee. The total Galla population, who call themselves Argatta or Oromo, is approximatively estimated by Reclus at 3½ millions; the northern tribes are put by Paulitschke at 1¼ million. Politically they are divided into a great number of separate tribes (Itu, Arussi, Nole, Jarsso, Ala, Ennia, Walamo, Borana, &c.), which are frequently at war with one another. But their inveterate century-long foes are the Somali on the north-east and east, who have gradually driven back the Gallas from the shores of the Red Sea and the extremities of the Somali peninsula, regions which were occupied by them in the 16th century, just as on the other side the Abyssinians and Shoans have beaten them back southwards. The country they now inhabit is, generally speaking, a plateau that slopes south-eastward to the Indian Ocean, and has a hilly, well-timbered surface. On the north, from Harar to the Hawash, stretches the watershed dividing the rivers that flow to the Red Sea and Gulf of Aden from those that drain south-eastwards to the Indian Ocean, and culminating in two limestone massifs (7250 feet), called Concuda and Gara Mulata. The watershed separating the rivers Webi (with its tributary the Erer) and Wabi (also called Juba), which flow south-east to the Indian Ocean, from the feeders of the Upper Nile region, skirts the western side of the Galla territory. This region, with plenty of rains and running streams, a rolling surface diversified with hill-chains, and abundant vegetation, is well cultivated, and yields wheat, barley, beans, sorghum, sweet potatoes, flax, lentils, cotton, and coffee. Its average elevation is 7200 feet. Amongst all the western tribes inhabiting this region slavery is a recognised institution. See Paulitschke, *Ethnographie und Anthropologie der Somal, Galla, und Harari* (Leip. 1886), and in *Globus*, 1889, and Cecchi, *Fra Zeila alle Frontiere del Caffa* (2 vols. Rome, 1885).

Gallatin, Albert, financier and statesman, was born at Geneva in 1761, and graduated at the university there in 1779. In 1780 he went to the United States, where he engaged in trade, and was for a time teacher of French in Harvard College. Afterwards he purchased land in Virginia and Pennsylvania, and made his entrance into political life in the latter state in 1789. In 1793 he was elected to the United States senate, and in 1795 entered congress. In 1801-13 he was Secretary of the Treasury, in which post he was of signal service to his adopted country, and showed himself one of the first financiers of his day. He took an important part in the negotiations for peace with England in 1814, and signed the treaty of Ghent. From 1815 to 1823 he was minister at Paris, and in 1826 he was sent to London as ambassador-extraordinary. On his return in 1827 he settled in New York, and devoted much of his time to literature, being chiefly occupied in historical and ethnological researches. He was one of the founders and the first president of the Ethnological Society of America; and from 1843 to his death he was president of the New York Historical Society. He died August 12, 1849. His works include publications on finance, politics, and ethnology; among these last are *The Indian Tribes*

east of the Rocky Mountains, &c. (1836), and *Notes on the Semi-civilised Nations of Mexico, Yucatan, and Central America* (1845). See the Lives by Henry Adams (1879) and J. A. Stevens (in the 'American Statesman' series, 1883).

Gallaudet. See DEAF AND DUMB.

Gall-bladder. See LIVER.

Galle, or POINT DE GALLE, a fortified town and seaport of the south-west extremity of the island of Ceylon, stands on a low rocky promontory of the same name, and has a good harbour, formed by a small bay. It has lost its former importance as a coaling and transhipping station for the great lines of steamers from Europe to Australia and China since the completion of the breakwater at Colombo (q.v.). It is the capital of the southern province of Ceylon. Pop. (1891) 33,505. See CEYLON.

Galle'go, one of the principal affluents of the Ebro (q.v.).

Galleon (Spanish), a large ship formerly used by the Spaniards to carry home the gold, silver, and other wealth contributed by the Mexican and South American colonies. They were armed, and had usually three or four decks, with bulwarks three or four feet thick, and stem and stern built up high like castles. They had a particular fascination for Drake and other Elizabethan rovers, who so contrived that many of them never reached the ports of Spain.

Gallery, a word with several applications in architecture. A long passage or corridor is called a gallery. A long room, such as is frequently used for exhibiting pictures; a raised floor in any apartment, supported on pillars; a long passage in the thickness of the wall, or supported on cantilevers (as the Whispering Gallery of St Pauls)—all these are called galleries. They were of frequent use in the buildings of the middle ages. The Rood-loft (see ROOD) is a gallery running across a church at the entrance to the choir, and supporting a large cross. Organ galleries are also frequent, either in the position of the roodloft, or at one end of the nave or transept, or corbelled out from the side-wall. In old baronial halls the end next the door was usually screened off as an entrance passage, and above the screen was almost invariably a gallery for musicians. In Scottish castles such a gallery was frequently constructed in the thickness of the wall. In the older German and French churches the side-aisles were divided into two stories—the upper forming a gallery said to be for the exclusive use of the women. The arrangement of galleries in tiers one over the other, now so much used in churches, theatres, &c., is entirely modern, dating from the 17th century. For galleries in the military and mining connection, see MINES.

Galley, a long, narrow row-boat, carrying a sail or two, but dependent for safety and movement mainly upon oars. These boats were called galleys, galleots, and brigantines (or frigates) according to their size: a galleot is a small galley, while a brigantine is still smaller. The number of men to each oar varied according to the vessel's size: a galley had four to six men working side by side to each oar, a galleot but two or three, and a brigantine one. A galley was 180 or 190 spans (of 9 to 10 inches) long, and its greatest beam was 25 spans broad. Such a vessel carried two masts—the *albero maestro* or mainmast, and the *trinchetto* or foremast, each with a great lateen sail. The Genoese and Venetians set the models of these vessels, and the Italian terms were generally used in all European navigation till the northern nations took the lead in sailing ships. These sails were often clewed up, however, for the mariner of the 16th century was ill-practised in the art of tacking, and very fearful of losing sight of land for long, so that unless he had a wind fair astern he preferred to trust to his oars. A short deck at the prow and poop served, the one to carry the fighting men and trumpeters and yardsmen, and to provide cover for the four guns; the other to accommodate the knights and gentlemen, and especially the admiral or captain. Between the two decks, in the ship's waist, was the propelling power—say fifty-four benches or banks, twenty-seven a side, supporting each four or five slaves, whose whole business in life was to tug at the fifty-four oars. If a Christian vessel, the rowers were either Turkish or Moorish captives, or Christian convicts; if a Barbary corsair, the rowers would all be Christian prisoners.

Sometimes a galley-slave worked as long as twenty years, sometimes for all his miserable life, at this fearful calling. The poor creatures were chained so close together on their narrow bench that they could not sleep at full length. Sometimes seven men (on French galleys, too, in the 18th century) had to live and sleep in a space 10 feet by 4. Between the two lines of rowers ran the bridge, and on it stood two boatswains armed with long whips, which they laid on to the bare backs of the rowers with merciless severity. Biscuit was made to last six or eight months, each slave getting 28 ounces thrice a week, and a spoonful of some mess of rice or bones or green stuff. The water-cans under the benches were too often foul. The full complement of a large galley included, besides 270 rowers and the captain, chaplain, doctor, scrivener, boatswains, and master or pilot, ten or fifteen gentlemen adventurers, friends of the captain, sharing his mess, and berthed in the poop, twelve helmsmen, six foretop able-bodied seamen, ten warders for the captives, twelve ordinary seamen, four gunners, a carpenter, smith, cooper, and a couple of cooks, together with fifty or sixty soldiers, so that the whole equipage of a fighting galley must have reached a total of about four hundred men.

What is true of a European galley is also generally applicable to a Barbary galleot of eighteen to twenty-four oars, except that the latter was generally smaller and lighter, and had commonly but one mast and no castle on the prow. The crew of about two hundred men was very densely packed, and about one hundred soldiers armed with muskets, bows, and scimitars occupied the poop. The rowers on Barbary galleys were generally Christian slaves belonging to the owners, but when these were not numerous enough other slaves, or Arabs and Moors, were hired. The complement of soldiers, whether volunteers or Ottoman janissaries, varied with the vessel's size, but generally was calculated at two to each oar, because there was just room for two men to sit beside each bank of rowers. They were not paid unless they took a prize, nor were they supplied with anything more than biscuit, vinegar, and oil—everything else they found themselves. Vinegar and water with a few drops of oil on the surface formed the chief drink of the galley-slaves, and their food was moistened biscuit or rusk and an occasional mess of gruel.

A galleass was originally a large, heavy galley, three-masted, and fitted with a rudder, since its bulk compelled it to trust to sails as well as oars. It was a sort of transition-ship between the galley and the galleon, and as time went on it became more and more of a sailing ship. It had high bulwarks with loopholes for muskets, and there was at least a partial cover for the crew. The Portuguese galleys in the Spanish Armada mounted each 110 soldiers and 222 galley-slaves; but the Neapolitan galleasses carried 700 men, of whom 130 were sailors, 270 soldiers, and 300 slaves of the

oar. In France the convict galleys were gradually superseded from 1748 by the Bagnes (q.v.). John Knox laboured for eighteen months at the oar, and St Vincent de Paul (q.v.) did much for the galley slaves. See also TRIREME, SHIPBUILDING.

Furttenbach, *Architectura Navalis*; S. Lane-Poole, *The Barbary Corsairs* ('Story of the Nations'); and M. Oppenheim, in *Gentleman's Magazine* (1885).

Gall-fly, or GALL WASP, names generally applied to any member of a large family (Cynipidæ) of Hymenopterous insects, most of the females of which lay their eggs in plants and by the associated irritation produce galls. The insects are not unlike little wasps, with straight, thread-like antennæ, laterally compressed abdomen, and long wings.

Fig. 1. Bedeguar Gall of Wild Rose.

The eggs are laid in the leaves, twigs, roots, &c. of plants, which the mothers pierce with their ovipositors. The irritation of the wound and of the intruded and rapidly developing eggs results in pathological excrescences or galls. Within these the larvæ feed and grow, and either eat their way out while still grubs or remain till the pupa stage is past and emerge as adolescent insects. A gall may contain a single egg and larva or many, and both external form and internal structure vary widely. Each gall-fly has its favourite or exclusive host, and usually restricts its egg-laying to some special part of the plant. While most produce true galls, some members of the family act like cuckoos and utilise galls already formed by other genera. Others again depart more widely from the general habit and deposit their ova in other insects. The genera Cynips, Aphilotrix, Andricus, Neuroterus, Spathegaster, Biorhiza all form galls on oaks; Rhodites is the cause of mossy excrescences on rose bushes. Among those which utilise already formed galls Synergus and Aulax are important genera; while Ibalia, Figites, Eucoila, and the minute species of Allotria are in their youth parasitic on other insects such as flies and plant lice.

The reproductive relations of gall flies are very interesting: in many cases parthenogenesis undoubtedly occurs; in some species—e.g. of Rhodites, no males have ever been found; in other forms the

Fig. 2.

a, oak gall produced by [illegible]; *b*, section of gall; *c*, gall insect [illegible].

males when they occur are very few in proportion to the females. It must be emphasised that many gall-wasps distinguished by entomologists as separate species or even referred to different genera have turned out to be the parthenogenetic and the sexual forms of one species. A common life history is as follows: (*a*) Out of a summer-gall male and female forms emerge; (*b*) the females lay their fertilised eggs and give origin to winter-galls in so doing; (*c*) from these winter-galls there arise parthenogenetic females which in their egg-laying produce the summer-galls from which we started.

Among the common gall-wasps *Cynips quercus folii* makes the cherry-galls of oak leaves; *C. tinctoria* produces the well-known ink-gall of the Levantine oak; *Rhodites rosæ* forms the curious and familiar 'Bedeguar' (q.v.) on wild roses.

See GALLS, INK, INSECT, PARTHENOGENESIS. For the life histories, see Adler, *Zeitsch. f. wiss. Zool.* (1881), and his *Alternating Generations, a Study of Gall Flies* trans. 1894); *Annals and Magazine of Natural History* (5th series, vol. viii.); Bassett, *Canad. Entomologist* 1873-75, p. 91; W. K. Brooks, *Heredity* (Baltimore, 1883).

Galliard, the name of a lively dance, the same, according to Brossard, as the *Romanesca*, a favourite dance with the Italians. The air is mostly in $\frac{3}{2}$ or $\frac{3}{4}$ time, but sometimes also in $\frac{4}{4}$ or $\frac{4}{2}$ time. The tempo is also quick and lively, with a flowing melody. Many galliard tunes are still extant, distinguished by such names as *The King of Denmark's Galliard*, *The Earl of Essex's Galliard*, and the like. The word is due to the Spanish *gallarda*, of dubious origin; Diez refuses to connect it with *gala* and *gallant* (Span. *galante*) on account of the double *l* and the French form *gaillard*, itself most likely of Celtic origin.

Gallic Acid, $HC_7H_3O_4.H_2O$, is an acid which exists in small quantity in gall-nuts, in valonia (the acorn-cup of *Quercus ægilops*), in divi-divi (the pod of *Cæsalpinia coriaria*), in sumach, and other vegetables. It is usually prepared from gall-nuts, which, in addition to gallic acid, contain a large proportion of tannin (tannic acid or gallo-tannic acid). When the gall-nuts are digested with water for some weeks fermentation takes place, and the tannic acid is gradually converted into gallic acid. The same result is obtained more quickly if sulphuric acid be present. To obtain pure gallic acid the gall-nuts are boiled with water, and the hot liquor separated. On cooling gallic acid crystallises out, and is further purified by solution in hot water and treatment with animal charcoal.

It forms delicate, silky, acicular crystals, nearly colourless, and having a sourish taste. It is soluble in 3 parts of boiling water, but only in 100 of cold water, and on this account it can be readily purified by recrystallisation. With solution of iron salts (ferric) it produces a blue-black colour, and finally yields a black precipitate on exposure to the air. Hence it may be used in the production of ink, for which purpose it has some advantages over tannin or gall-nuts. When the crystals are strongly heated pyrogallic acid is produced and sublimes over. Gallic acid is a useful astringent. As it does not coagulate albumen it is readily absorbed into the blood, and in this way it is efficacious in Bright's disease. Where a decided local astringent effect is desired tannic acid is much more powerful.

Gallican Church, the designation applied to the Catholic Church in France, in respect of the more or less independent attitude which it formerly occupied toward the Roman see.

Flourishing Christian communities already existed at Lyons and Vienne at the time of the persecution under Marcus Aurelius, when the aged bishop Pothinus was martyred (177). The origin of these churches is traced principally to Asia Minor, where Irenæus (q.v.) was born, and they were in intimate connection with Smyrna and other churches of the East. The historian Gregory

of Tours (6th century) speaks of seven missionary bishops sent to Gaul from Rome, of whom Saturninus settled at Toulouse, Dionysius at Paris, and Trophimus at Arles. Probably his account is a combination of various local traditions of the first bishops of important towns with a much earlier narrative of the martyrdom of Saturninus under Decius (250). Although sharing in the general literary inferiority of Western ecclesiastics during the early period, the church of Gaul numbers several eminent names in the literature of the 3d, 4th, and 5th centuries. The works of Irenæus, Sulpicius Severus, Hilary of Poitiers, Hilary of Arles, Vincent of Lerins, Prosper, Victor, Eucherius, Salvian, and Gregory of Tours combine to form a body of literature of which the later French Church is not unreasonably proud. The hierarchical organisation of the church in Gaul was from an early period among the most complete and regular in western Christendom; and in the council held at Arles in 314 we may recognise the titles of many bishops of sees which are still represented in the episcopate of France.

But the history of the Gallican Church, so far as regards the development of those peculiar principles which have acquired the distinctive name of 'Gallicanism,' begins at a much later period. From circumstances which are differently viewed by the opposite schools of theology, the papacy began, from the very date of the establishment of the Western Empire, to exercise a large influence over the civil as well as ecclesiastical affairs of the several European kingdoms. On the other hand, owing to the intimate connection between the church and state in most of these kingdoms, and especially to the feudal relations between the crown and the church dignitaries, the crown also asserted a correlative claim to certain privileges in respect of ecclesiastical affairs. The satisfactory adjustment of these conflicting claims was the great problem of medieval polity; and the alternations of the struggle between them form the staple of medieval history. In the church of France the party maintaining the prerogatives of the French crown and the privileges of the national church of France against the adverse claims of the Roman see gave to the principles which they professed the name of Gallicanism. This name has come to designate, in general, that system in Roman Catholic theology which, while it recognises the primacy of the Roman pontiff, by divine right, over the universal church, yet asserts the independence of national churches in many details of self-government and of local discipline, and limits the papal prerogatives by canons and decrees of general councils and by the laws of the universal church. It must be added that, while the Gallican theory to this extent claims exemption from the authority of the pope, it acquiesces, to an almost proportionate degree, in the assumption of ecclesiastical authority on the part of the state.

We can recognise the working of these principles in the opposition which the so-called Isidorian decretals (see CANON LAW) encountered in France. They were embodied, during the reign of St Louis, in the Pragmatic Sanction of 1269, which provided that the administration of the church should be in conformity with 'the common law, the canons of Councils, and the statutes of the ancient Fathers.' They were carried to their extreme extent by Philippe le Bel in his contest with Boniface VIII. The conflicting claims of the rival popes in the Western schism tended still more to weaken the papal authority; and the expedient of convening a general council to pronounce upon these claims gave prominence to one of the leading dogmas of Gallicanism—the superiority in point of authority of a general council to the pope. The disciplinary enactments of the councils of Constance and Basel were mainly directed towards the limitation of the papal authority in the exercise of church patronage; and these enactments were in the main embodied in the French law by the celebrated Pragmatic Sanction (q.v.) of Bourges in 1437.

The Pragmatic Sanction was superseded in 1516 by the Concordat of Bologna between Leo X. and Francis I. This treaty gave the nomination of bishops to the crown, and the right of instituting them to the pope, but it was with the greatest reluctance, and only 'at the express command of the king,' that the Parlement of Paris registered (1518) the papal bull that condemned the Pragmatic Sanction. The purely Gallican principles of the councils of Pisa, Constance, and Basel still remained the standard expression of French convictions as to the rightful position of the church. The great jurists Pithou and Dupin, in asserting the liberties of the church, equally enforced the privileges of the crown. It was a contest between Louis XIV. and Innocent XI. regarding the so-called right of Regalia—the right claimed by kings of receiving the revenues of a bishopric during a vacancy, and of presenting to benefices pending a new appointment—that led to the famous Declaration of the French Clergy in 1682, which has since been regarded as the charter of Gallicanism. This formulary emanated from an extraordinary assembly of 35 bishops and 35 other clergy convened by royal authority at Paris, 19th March 1682. It was drawn up by Bossuet, and consists of four articles. The first declares that 'the jurisdiction of St Peter and his successors in the Roman see as vicars of Christ on earth, although divinely bestowed, is confined to things spiritual and appertaining to salvation, and does not extend to civil or temporal affairs.' The article therefore declares 'that princes are not subject in temporal things to any ecclesiastical authority;' that they cannot be deposed 'either directly or indirectly by the power of the keys, and that their subjects cannot be dispensed from their subjection or released from their allegiance.' The second article renews the declaration of the Council of Constance with regard to the superiority of a general council over the pope, and declares that that article is not to be restricted in its application to a period of schism such as existed at the time of the council. The third asserts that the authority of the pope is 'to be restricted by the canons of the universal church,' and that 'the rules, customs, and institutions of the Gallican kingdom and church remain in full force.' This is the article which asserts the celebrated 'Gallican Liberties.' The fourth article, while it concedes to the pope 'the chief part in questions of faith,' and professes that 'his decrees extend to each and every church,' nevertheless maintains 'that his judgment is not irreformable, unless it shall have been confirmed by the consent of the entire church.' The chief rules, customs, and institutions of the Gallican Church referred to in the third article are, that the Gallican Church does not receive all the decrees of councils and of popes in matters of discipline, and that those only are in force which are so received; that the Gallican Church holds itself free to receive or reject the rules of the Roman chancery; that the Roman pontiff cannot levy any impost from the French clergy without their own consent; that he cannot bestow of his own motion on a foreigner any benefice within the French Church; that neither he nor his legates can hear French causes in 'the first instance,' and that in cases of appeal he is bound to assign native judges to hear the appeal, even if the appellant should be a metropolitan or primate; that the French bishops shall not be required to attend any general council except with the permission of

the crown. The last of these 'customs,' as also those which make the receiving or not receiving the general canons of discipline optional in France, and which practically throw the decision into the hands of the civil power, have been with much show of reason denominated the 'Slaveries' rather than the 'Liberties' of the Gallican Church.

This Declaration was strenuously enforced for the next ten years by Louis XIV. It was condemned by Pope Alexander VIII. in 1690, by Clement XI. in 1706, and again by Pius VI. in 1794; but both the acceptance of the articles and their condemnation were understood to be with certain reservations. The Gallican Church underwent very extensive modifications at the close of the 18th and the beginning of the 19th century. The enactment in 1790 of the 'civil constitution of the clergy' introduced a large infusion of the democratic element. The church was first secularised, and then swept away, till Bonaparte, as First Consul, restored it in a fresh concordat with the pope (1801). Yet the conflict with Rome still continued, and in 1810 a decree of the emperor made the declarations of 1682 once more the law of France. Pius VII. was forced by circumstances to enter into the concordat of Fontainebleau (1813), in which his right to the institution of bishops was not recognised, but on the advice of his cardinals his acceptance of this treaty was speedily recalled. After the Restoration the king agreed to a new concordat with the pope (1817), superseding the agreement of 1801, and returning to that of 1516; but this 'ghost of the past' found little favour with the French people, and in 1826 was met by a solemn declaration of all the bishops that they still adhered to the propositions of 1682. In 1830 the relations of church and state were again revised, and the freedom of all confessions was declared. The constitution of 4th November 1848 guaranteed payment by the state to the clergy of all religions recognised by the state then or at a later time. Under the Second Empire the influence of Rome steadily increased, spite of the ambiguous attitude of the emperor.

Within the 19th century the opinions of the French clergy underwent a decided change. The Gallican doctrines were much less commonly held, and in a less extreme form, and fell into great discredit with the church party. The climax of this reaction was seen in the conduct of the French bishops at the Vatican Council (1869-70), in which a great body of them were foremost in renouncing the Gallican articles and accepting the doctrine of papal infallibility; and even those who, like Bishop Dupanloup of Orleans, contended for the opposite view, in the end acquiesced in the decision of the majority. In France at the present day the old theological divergences seem to have passed out of view in presence of the conflict between the modern state and Ultramontanism.

The chief authorities are Pithou, *Les Libertés de l'Eglise Gallicane* (1594, 2 vols. fol. 1639); Dupuy, *Preuves des Libertés de l'Eglise Gallicane* (1638); and Bossuet, *Defensio Declarationis* (Luxemburg, 2 vols. 1730; French trans. 2 vols. Paris, 1735). See also De Maistre, *De l'Eglise Gallicane* and *Du Pape* (2 vols. 1820); Dupin, *Les Libertés de l'Eglise Gallicane* (Paris, 1824; new ed. 1860); Bordas Demoulin, *Les Pouvoirs Constitutifs de l'Eglise* (1855); Huet, *Le Gallicanisme, son passé, sa situation présente* (1855); Puyol, *Etudes sur la Renovation du Gallicanisme* (2 vols. 1876); W. H. Jervis, *History of the Church of France from the Concordat of Bologna, 1516 A.D., to the Revolution* (2 vols. Lond. 1872), and its sequel, *The Gallican Church and the Revolution* (1882).

Gallienus, Publius Licinius, Roman emperor from 260 to 268 A.D. His father, Valerian, had made him co-regent with himself in 253, but his reign ended when he was taken prisoner by the Persians seven years later. The authority of Gallienus was limited almost entirely to Italy, for throughout the provinces the legions for the most part revolted, and raised their commanders to the dignity of Cæsars. Hence the period is known in history as the Time of the Thirty Tyrants. In the East the honour of the Roman arms was maintained by Aurelian, Probus, and others, who found a useful ally in Odenathus, ruler of Palmyra, and his wife Zenobia, to whom Gallienus entrusted the care of the war against the Persians. In the West, however, dangers thickened about him. Aureolus was proclaimed emperor by the legions of Illyricum, and, having marched into Italy, he seized Milan, and proceeded towards Rome. The war between the two was carried on for some time with undecided success, but Gallienus, while besieging his adversary in Mediolanum (Milan), was murdered by some of his officers, 268 A.D. He was succeeded by Claudius II.

Gallinaceous Birds (Lat. *gallus*, 'a cock'), or Rasores (Lat., 'scrapers'), an old order of birds, including the Fowls, Sand-grouse, Hemipods—e.g. Turnex, and often also the Pigeons. The title Gallinæ is often still used to include the pheasant family (Phasianidæ), the grouse (Tetraonidæ), the sand-grouse (Pteroclidæ), the Turnicidæ, the mound-makers (Megapodiidæ), the curassows and guans (Cracidæ), the Tinamous (Tinamidæ), altogether over 400 species and about fourscore genera, and including forms of high antiquity. Interesting analogies have been pointed out between this order of birds and the order of Ruminants among Mammals, in the complexity of the digestive organs, bulkiness of the frame, low intelligence, easy domestication, usefulness to man, and proneness to variation from the influence of external circumstances, giving rise to different breeds. See Poultry, Grouse, Pheasant.

Gallinule. See Water-hen.

Gallio, Junius Annæus, the Roman proconsul of Achaia under Claudius when St Paul was at Corinth, 53 A.D. He was brother of the famous Seneca, and had procured his name by adoption into the family of Gallio the rhetorician. He resigned the government of Achaia owing to ill-health, and later is said to have been put to death by Nero. The narrative in the Acts tells how, with regard to the clamour of the Jews against Paul, he was 'not minded to be a judge of these matters,' and how 'Gallio cared for none of these things;' hence his name has become a synonym for a careless, easy-going, and indifferent man who keeps himself free from trouble and responsibility.

Galliot, a Dutch vessel carrying a main and a mizzen mast, and a large gaff-mainsail. Galliots—strong-built, flat-bottomed ships—of 400 to 500 tons burden, were formerly used also as bomb-vessels. The word is ultimately a diminutive of Low Lat. *galea*, 'a galley.'

Gallip'oli (the *Kallipolis* of the Greeks), a town of Southern Italy, is built on a steep insulated rock in the Gulf of Taranto, connected with the mainland by a bridge, and is 59 miles by rail S. of Brindisi. The harbour is protected by a mole and fortified. The town contains a handsome cathedral, and is remarkable for its oil-tanks, excavated in the solid rock, in which olive-oil is deposited for exportation. Pop. 8083.

Gallipoli, a seaport of Turkey, on the peninsula of the same name (the ancient Thracian Chersonesus), at the north-eastern extremity of the Dardanelles, 90 miles S. of Adrianople, and 130 WSW. of Constantinople. The ancient *Kallipolis*, of which some ruins remain, it was formerly the

most important commercial town on the Hellespont, and still retains considerable trade. There are two harbours, extensive bazaars, and some manufactures. Gallipoli is the headquarters of the Turkish fleet, and the seat of a Greek bishop, and contains numerous mosques and fountains. The population is slightly over 15,000. The town was taken by the Turks in 1356, and formed their earliest European possession; and here the allies disembarked during the Crimean war.

Gallipot, the name given to a pot painted and glazed, commonly used for medicine. The word is a corruption of the Old Dutch *gleypot*, and already appears in Beaumont and Fletcher, *gley* being the same as the North Friesic *gläy*, 'shining,' and cognate with Ger. *glatt* and Eng. *glad*.

Gallitzin. See GALITZIN.

Gallium (sym. Ga, eq. 69·8) is a metal discovered by M. Lecoq de Boisbaudran in 1875 in a zinc-blende found in the Pyrenees. It has also been found in blendes from Asturia and from Bensberg. Strange to say, its properties and its salts were predicted before its existence was known by Mendeleëff, in virtue of his Periodic Law (see ATOMIC THEORY, Vol. I. p. 552). Gallium is of a bluish-white colour, and has a specific gravity of 5·9. It possesses the remarkable property of fusing at 30·1° C. (76° F.), and remaining liquid when cooled down even to 0°. If, however, the globule of molten metal be touched with a fragment of solid gallium, it at once solidifies. Heated to bright redness in contact with air gallium does not volatilise, and only a very thin coat of oxide is formed on the surface. Gallium, which has no industrial importance, dissolves readily in hydrochloric acid and in caustic potash with evolution of hydrogen. It forms one oxide, Ga_2O_3, which is insoluble in water, but soluble in potash and ammonia. The chloride, nitrate, and sulphate are all very soluble in water; the sulphate combines with ammonium sulphate to form an alum.

Gallomania. See ANGLOMANIA.

Gallon, the standard unit of measure for liquids throughout the United Kingdom. It has existed as a measure from the earliest times, and in consequence has undergone many changes. The oldest exchequer standards preserved in the Standards Office include a Winchester corn gallon, of a capacity of 274¼ cubic inches, constructed by order of Henry VII.; Queen Elizabeth added a standard ale gallon in 1601 of 282 cubic inches, and Queen Anne added in 1707 a standard wine gallon of 231 cubic inches. All these standard measures, however, were abolished in 1824, when the present imperial gallon, containing 10 lb. of distilled water, weighed in air (the barometer being at 30 inches, and the thermometer at 62° F.), was made the standard of capacity for liquid measures. This gives 277·274 cubic inches. The United States gallon is that of 231 inches, so that 59 imperial gallons are equal to 71 United States standard gallons. See WEIGHTS AND MEASURES.

Gallotannic Acid, a name of Tannic Acid (q.v.).

Galloway, an extensive district in the south-west of Scotland, once somewhat larger, but now entirely comprised in the shire of Wigtown and stewartry of Kirkcudbright. It enjoys a remarkably mild climate, and has long been famous as a pastoral country, its breed of small horses and of large hornless black cattle being well known centuries ago; but the enormous improvement of agriculture under the fostering care of two genera tions of singularly public-spirited landlords has made dairy-farming now the most important industry. The province is about 70 miles in length by 40 at its utmost breadth, and contains the greatest diversity of scenery—mountain, lake, and stream, as well as dreary waste and almost pathless moor. There is no mineral wealth and hardly an industry, hence the inhabitants are almost entirely concerned with the primitive occupations of man—tilling the soil, sheep and cattle rearing, and fishing. They are simple, honest, and hospitable, with almost every virtue proper to a peasantry save severe morality. A more detailed account of the country and its productions will be given under the heads KIRKCUDBRIGHT and WIGTOWN.

The province owes its name to the fact that the natives were called Gall-Gael, or foreign Gaels, at first because of their falling under the foreign rule of the Anglians; but as the Picts of Galloway they continued to be known so late as the Battle of the Standard in 1138. Their geographical position had shut them off from their northern congeners, and they continued under their ancient names a distinct people till the 12th century, and preserved their language—which was substantially identical with Gaelic—till the 16th, when it finally disappeared before the Reformation and the use of Lowland Scotch in the parish churches and schools, leaving only a rich crop of place-names wonderfully similar to those of Ireland and the south-western Highlands of Scotland. The earliest inhabitants are styled by Ptolemy the *Novantæ*, to the west of the Nith, with two towns, *Lucophibia* at Whithorn and *Rerigonium* on the eastern shore of Loch Ryan; and the *Selgovæ*, covering Dumfriesshire, with the towns *Trimontium*, *Uxellum*, *Corda*, and *Carbantorigum*, the sites of which are placed by Mr Skene on Birrenswark Hill, on Wardlaw Hill, at Sanquhar, and at the moat of Urr, between Nith and Dee. Tacitus tells us that Agricola concentrated a force in that part of Britain which looks on Ireland, and most authorities identify this with Galloway rather than, as Mr Skene, with the modern county of Argyll. This view is borne out by the discovery of Roman forts in Wigtownshire and the Stewartry in situations corresponding with those of the towns of the Novantæ described by Ptolemy as existing in the time of Hadrian. Galloway was subdued by the Northumbrian Anglians of Bernicia during the 7th century, and governed by them for about two hundred years, and it was to this period apparently that the modern name is due. After about three centuries of more or less complete independence, interrupted only by Norse ravages and at length by a period of Norse supremacy, it was recovered by Malcolm Canmore, granted as an earldom in 1107 to his youngest son David, and on his accession to the throne in 1124 formally united with Scotland. Of the native lords of Galloway we read of a doubtful 'Jacobus, rex Galwalliæ' as one of the eight tributary princes who waited on Edgar at Chester in 973. A more historical figure is Fergus, appointed first Earl of Galloway, after the fall of Ulgric and Duvenald, lords of the Galivenses, at the Battle of the Standard. With Somerled he made an unsuccessful revolt against Malcolm IV., and was obliged to give his lordship to his sons, Uchtred and Gilbert, who in their turn, when William the Lion was taken prisoner at Alnwick in 1174, attempted, but in vain, to throw off the Scottish yoke, even offering fealty to England. Roland, a son of Uchtred, did homage to Henry II. of England, and his son Alan, who succeeded in 1200, was one of the barons who forced John to sign Magna Charta, but seems later to have returned to his Scottish allegiance. At the dispute for the Scottish crown, which opened in 1291, the lordship of Galloway through descent and marriage was in the hands of John Baliol, Alexander Comyn, and two others; consequently the Galwegians resisted

Robert Bruce in his struggle with England for the Scottish crown. The province was traversed successively by Wallace, Edward I., and Bruce, and was at length subdued for his brother by Edward Bruce in 1308. Again in 1334 it was seized by Edward Baliol, but his power was at length overthrown, and in 1369 the eastern part of Galloway was granted by the crown to Archibald Douglas, surnamed the Grim, who built himself the stronghold of Threave Castle on a small island in the Dee. His haughty and turbulent descendants built up a power so formidable as to threaten the crown itself, until they fell finally in 1455, when the lordship of Galloway was attached to the crown. These ages of troubles had generated a turbulent spirit among the Galwegians, and it was long before they settled down into peaceful and industrious citizens. They achieved a more honourable eminence by their devoted loyalty to the Covenant, which they had embraced with all their ancient ardour. Not all the infamous cruelties carried out at the bidding of a corrupt government by Turner, Grierson, and Claverhouse could crush the spirit of these 'wild western Whigs' whose martyr graves are scattered over the moors of Galloway.

See Symson's *Description of Galloway, 1684* (1823); Murray's *Literary History of Galloway* (1822); Mackenzie's *History of Galloway* (2 vols. Kirkc. 1841); Sir Andrew Agnew's *History of the Hereditary Sheriffs of Galloway* (new ed. 1893); M'Kerlie's *History of the Lands and their Owners in Galloway* (5 vols. 1870-78); and *Galloway in Ancient and Modern Times* (1891); Sir H. E. Maxwell's *Studies on the Topography of Galloway* (1887).

Galloway, Mull of, a bold headland of precipitous rock, the southern extremity of the peninsula called the Rhinns of Galloway, in Wigtownshire, and the most southern point of Scotland. It is 1¼ mile long, and ¼ of a mile broad, and rises to a height of 210 feet at its eastern extremity, on which stands a lighthouse 60 feet high, whose intermittent light is visible at a distance of 23 nautical miles. The summit of the lighthouse commands a magnificent prospect of sea and sky, extending to the Isle of Man, 23 miles to the south, to the coast of Ireland, 26 miles to the west, and sometimes even to the Cumbrian mountains, more than 50 miles distant. The Mull is part of the parish of Kirkmaiden, and is 5 miles from Drumore and 23 south of Stranraer.

Gallowglass, a heavy armed foot-soldier in the ancient Irish wars. They are grouped with *kernes* in Shakespeare's *Macbeth* (I. ii. 13) as coming from the western isles of Scotland. The word is of course Irish, formed from *giolla*, 'a man-servant,' and cognate with the well-known *gillie*.

Galls (when large, dry, and nut-like often called Gall-nuts, also *Nut-galls* and *Oak-apples*) are the abnormal vegetative growths produced in various plants through the introduction of the eggs, and the development of the larvæ of the various gall-insects. The economic usefulness and consequent commercial importance of so many of the large forms, essentially due to the presence of a large quantity of tannic acid, is noticed at Tannin. See also Gall Fly, Gallic Acid, Leather.

Gall-stone. See Calculus.

Gallus, C. Cornelius, a Roman poet, born at Forum Julii (mod. Fréjus), in Gaul, about 66 B.C. He lived at Rome in intimate friendship with Virgil, Asinius Pollio, Varus, and Ovid, and was appointed by Augustus prefect of Egypt, but fell deservedly into disfavour and was banished, whereupon he ended his disgrace with his own sword about the year 26 B.C. Gallus was reckoned the founder of the Roman elegy, from his four books of elegies upon his mistress Lycoris, of which but a few slight fragments have come down to us. His name was adopted by W. A. Becker as the title of his well-known picture of Roman domestic life: *Gallus, Römische Scenen aus der Zeit Augusts* (1838). See Volker, *Commentatio de C. Galli vita et scriptis* (1840-44).

Gallus, Trebonianus, Roman emperor (251-253 A.D.), was the successor of the ill-fated Decius, and is memorable only from the dishonourable peace which he purchased from the Goths, followed by a dreadful pestilence in Italy. His end was to be murdered by his own soldiers.

Galop, a lively kind of dance of German origin, somewhat resembling a waltz, danced in ¾ time. See Dancing.

Galston, a village of Ayrshire, 5 miles SE. of Kilmarnock by rail, with manufactures of muslins and lace. There is coal in the neighbourhood. Pop. 4085.

Galt, a town of Canada, province of Ontario, stands on the Grand River, 25 miles by rail E. by N. of Hamilton. The environs of the town are noted for their beauty. The chief industries are the manufacture of flour, machines, cast-iron, paper, soap, wooden ware, axes, and leather. Galt was founded in 1816. Pop. (1881) 5187; (1891) 7535, the majority being of Scotch descent.

Galt, John, Scotch novelist, was born at Irvine, in Ayrshire, May 2, 1779. His father, who was captain of a ship in the West Indian trade, left Ayrshire in 1789, and fixed his residence in Greenock. In that town Galt received his education, and was then placed in the custom-house. He remained there till 1804, when, panting for literary distinction, he proceeded to London with an epic poem on the battle of Largs in his portmanteau. On reaching the metropolis he printed his epic, but, becoming dissatisfied with its merits, ultimately withdrew it from the market. After a few years his health began to fail, and he was obliged to seek relief in a more genial climate. At Gibraltar he made the acquaintance of Lord Byron and his friend Hobhouse, and the three travellers became fellow-voyagers; but soon after Galt separated from his new friends to visit Sicily, then Malta, and finally Greece, where he again renewed his acquaintance with Byron, and had an interview with Ali Pasha. He next proceeded to Constantinople, and afterwards to the shores of the Black Sea. On one occasion when detained by quarantine he sketched six dramas which were afterwards given to the world. On his return he published with considerable success his *Letters from the Levant*, but first displayed distinct and individual power in *The Ayrshire Legatees*, which appeared in *Blackwood's Magazine* in 1820. Its successor, *The Annals of the Parish* (1821), met with unquestionable success, and remains his masterpiece. Having hit on the true vein he worked it assiduously, and produced in quick succession *Sir Andrew Wylie*, *The Entail*, *The Steamboat*, and *The Provost*. He then diverged into the walk of historical romance, and published *Ringan Gilhaize*, a tale of the Covenanters; *The Spaewife*, *Rothelan*, and *The Omen*. These works, although full of striking scenes and really good writing, were not so successful as his earlier and less ambitious performances. Galt, whose hands were always equally full of literary and commercial undertakings, was now busily engaged in the formation of the Canada Company; but before he left England for his distant scene of labour he gave to the world *The Last of the Lairds*.

He departed for Canada in 1826, but three years later returned to England a ruined man, and at once recommenced his literary labours with his

usual rapidity. His first novel was *Laurie Todd*, which was followed by *Southennan*, a romance of the days of Queen Mary; and this by a *Life of Lord Byron*, which ran through several editions, but which was roughly handled by the critics. In 1834 he published his *Literary Life and Miscellanies* in three volumes. He now returned to Scotland, utterly broken in health and spirits, and died at Greenock, 11th April 1839. While some of his productions are already forgotten, others will perish only with the language. A voluminous and unequal writer, he had rich humour, genuine pathos, and a rare mastery of the Scots dialect; in delineating the life of small Scottish towns and villages he was without a rival. See an edition of his works, with introduction by Crockett (1896); Mrs Oliphant's *William Blackwood & Sons* (1897); Sir G. Douglas, *The Blackwood Group* (1897).

Sir ALEXANDER TILLOCH GALT, his son, born at Chelsea, 6th September 1817, was elected to the Canadian parliament in 1849, and was finance minister in 1858–62 and 1864–66. In 1880–83 he was High Commissioner for Canada in Britain; and he served on the Washington Treaty and Halifax Fisheries Commissions. A G.C.M.G., he died 19th September 1893.

Galtees. See TIPPERARY.

Galton, FRANCIS, F.R.S., grandson of Dr Erasmus Darwin, and cousin of Charles Darwin, was born at Duddeston in 1822, and educated at King Edward's School, Birmingham. He studied medicine at the Birmingham Hospital and King's College, London, and graduated from Trinity College, Cambridge, in 1844. Having in 1846 travelled in North Africa, he explored in 1850 lands hitherto unknown in South Africa, publishing his experiences in his *Narrative of an Explorer in Tropical South Africa*, which obtained the gold medal of the Royal Geographical Society, and in *Art of Travel*, which passed through five editions between 1855 and 1872. His investigations in meteorology are recorded in *Meteorographica*, published in 1863. A member of a Meteorological Committee of the Board of Trade, he was appointed one of the committee entrusted with the parliamentary grant for the Meteorological Office. Latterly he has specially devoted himself to the problem of heredity, publishing *Hereditary Genius: its Laws and Consequences* (1869); *Experiments in Pangenesis* (1871); *English Men of Science: their Nature and Nurture* (1874); *Life-history Album* (1884); *Natural Inheritance* (1889), &c. He was general secretary of the British Association, 1863–68; President of the Anthropological Sections, 1877 and 1885; President of the Anthropological Institute, 1885–86.

Galvani, LUIGI, a famous anatomist, was born at Bologna, 9th September 1737, studied theology and subsequently medicine at the university there, and in 1762 was elected professor of Anatomy. His lectures enjoyed much popularity, and among other writings two treatises on the organs of hearing and on the genito-urinary tract in birds added considerably to his reputation. But Galvani owes the wide celebrity attached to his name to his discoveries in animal electricity. The story of the convulsive muscular movements produced in a skinned frog by a chance contact with a scalpel may be dismissed as unfounded; there is evidence that Galvani's views were based on experiments patiently conducted for many years before the publication of his *De viribus Electricitatis in Motu Musculari Commentarius* (1791). He was removed for a time from his post because of his refusal to take the oaths prescribed by the Cisalpine Republic, of which Bologna then formed a part; but he was afterwards reinstated, and died 4th December 1798, in Bologna, where his statue was erected in 1879. Most of his writings were published in a quarto edition in 1841–42 by the Academy of Sciences of his native city; but several manuscript treatises by him were discovered there in April 1889.

GALVANISM is one of the names of a particular branch of the science of electricity, given in honour of Luigi Galvani, from whose observations and experiments the historical development of current electricity dates. The term itself is rarely used now; and the subject will be found treated under ELECTRICITY. There are, however, other expressions which have been derived from the same source, and which are in common use. Such are galvanic current, galvanic cell, galvanic battery, and galvanometer. *Voltaic* may be, and very often is, used in place of *galvanic* in the first three expressions; but galvanometer is the one name for an instrument which measures the strength of an electric current by means of its effect upon a neighbouring magnet. The gradual disuse of the term galvanism is probably due to the recognition in these later times of the fact that, although Galvani's experiments were the beginning of the new era in electricity, it is to Volta that we are specially indebted for the development of the science along purely physical lines.

Galvanised Iron. This name is given to iron which has been coated with zinc to prevent its rusting. The iron is simply dipped in the melted zinc, and the name does not imply, as might be supposed, that any definite galvanic process is undergone. Galvanised iron first came into use about 1837, when iron cooking-vessels were treated in this way. Since then tinned iron has come into use for cooking-vessels, and galvanised iron is now employed chiefly for roofing purposes, buckets, telegraph wire, chains, &c. The process of manufacture is very simple. The zinc is melted, and dry sal-ammoniac poured on the top. This fuses and forms a protecting layer, keeping the surface of the metal clean. The iron plates or vessels, having been carefully cleansed by means of dilute hydrochloric acid and scrubbing with sand, are now introduced into the molten zinc, which immediately forms an alloy with the iron, and renders it incapable of rusting. Care must be taken not to immerse the iron for too long a time, for the alloy of zinc and iron melts at a comparatively low temperature, and there is a danger of destroying the vessel which is being galvanised. Galvanised iron is not so tough as iron itself, but still the freedom from rusting makes it specially applicable for many purposes. Galvanised iron water-pipes are now much employed in houses, but steam-pipes of this material are unsatisfactory: when exposed continuously to a moist steam heat, galvanised iron seems to become corroded, and small holes make their appearance. Galvanised iron is, of course, unsuitable where any acid is present, and any preparation containing vinegar will assume a disagreeable taste if placed in a galvanised vessel.

Galveston, a seaport of Texas, and third largest city of the state, is situated on Galveston Island, at the opening of the bay of the same name into the Gulf of Mexico, 214 miles ESE. of Austin by rail. The island is a low strip of land, some 30 miles long by 3 broad; the bay extends northward from the city to the mouth of the Trinity River, a distance of 35 miles, and has a breadth of from 12 to 18 miles. The city contains a Catholic cathedral, the Catholic University of St Mary, and the Texas Medical College; and it has several foundries, flour and planing mills, and machine-shops. Its harbour is the best in the state, protected since 1887 by a breakwater; and steamers make regular passages to New Orleans and the Gulf ports,

Havana, New York, and Liverpool. Cotton and cotton-seed oil form the great bulk of the foreign exports, which have a total annual value of $36,000,000. Galveston is the first port of the state, and third of the cotton ports of the world. Since 1895 harbour works have deepened the access through the bar to 18 feet. On 9th September 1900 a fearful hurricane destroyed the greater part of Galveston; here and in the neighbourhood 4000 lives were lost, and damage done to the amount of $10,000,000. Pop. (1850) 4177; (1870) 13,818; (1880) 22,848; (1890) 29,084.

Galway, in Connaught, is, after Cork, the largest of all the Irish counties; area, 1,569,505 acres. Pop. (1831) 414,684; (1871) 248,458; (1881) 241,662; (1891) 214,756 (208,011 Catholics). It is watered in the east by the Shannon and its feeders; in the west are Loughs Mask and Corrib. In the south are the Slieve-Baughta Mountains; and in the west are the Maam Turk Mountains, and the well known Twelve Pins, a striking mountain group, culminating in Benbaun (2395 feet). This western portion of the county is wild and romantic; the hills are separated by picturesque glens, and by secluded and beautiful loughs. South-west from Lough Corrib to the sea is the district called Connemara, which contains vast bogs, moors, lakes, and morasses, and presents a peculiarly bleak and dreary aspect. North-east of Connemara is Joyce's Country, and south-east of it is Iar-Connaught, or Western Connaught. The shore is much broken, offering many bays that serve as harbours for large vessels, and is fringed with numerous islands. The climate is mild and humid, but in low-lying localities is sometimes unhealthy. The richest soil occurs in the district between the head of Galway Bay and the Shannon. Agriculture and fishing are the most general pursuits. The lakes and loughs, as well as the coasts of Galway, are well stocked with fish. The county abounds in ancient remains of the Celtic as well as of the English period. Raths and cromlechs are numerous; there are seven round towers; whilst of many monastic ruins the finest is that of Knockmoy, near Tuam. Since 1885 Galway county has returned four members to parliament.

GALWAY BAY is an inlet of the Atlantic Ocean, on the west coast of Ireland, between the counties of Galway and Clare. It is a noble sheet of water, and offers great facilities for an extended commerce—being 30 miles in length from west to east, with an average breadth of about 10 miles, and is sheltered by the Arran Isles.

Galway, a municipal and parliamentary borough of Ireland, a seaport, and county of itself, stands at the mouth of the river Corrib, on the north shore of Galway Bay, 50 miles NNW. of Limerick, and 127 W. of Dublin by rail. The old town of Galway is poorly built and irregular. In the wall of a house here is the 'Lynch Stone,' bearing a skull and crossbones, and commemorating a mayor of Galway, James Lynch Fitzstephen, commonly called 'Mayor Lynch,' who, in 1493, like Brutus of old, condemned his own son to death for the murder of a Spaniard, and to prevent his being rescued, actually caused him to be hanged from a window of the old prison on that site. Hence some have derived Lynch Law (q.v.). The new town consists of well-planned and spacious streets, and is built on a rising-ground which slopes gradually toward the sea and the river. A suburb, called Claddagh, is inhabited by fishermen, who exclude all strangers from their society. Galway is the see of a Catholic bishop, but is in the Protestant Episcopal diocese of Tuam. The principal buildings are the cruciform church (Episcopal) of St Nicholas (1320), St Augustine's Catholic Church (1859), monasteries, nunneries, the county court-house, barracks, prison, infirmary, &c. Queen's College (1849) has eighteen professors and about a hundred students; its quadrangular buildings are spacious and handsome. Galway has flour-mills, a distillery, a foundry, extensive salmon and sea fishing, a good harbour, with docks that admit vessels of 500 tons, and a lighthouse. During 1858–64 a line of steamers plied between Galway and the United States. The exports consist mainly of agricultural produce, wool, and black marble. Galway returns one member to parliament. Pop. (1851) 20,686; (1881) 15,471; (1891) 13,746 (nine-tenths are Catholics).

Galway was taken by Richard de Burgh in 1232, and the ancestors of many of the leading families now resident in this quarter settled here about that time. From the 13th till the middle of the 17th century the place continued to rise in commercial importance. In 1652 it was taken by Sir Charles Coote after a blockade of several months; and in July 1691 it was compelled to surrender to General Ginkell. See Hardiman's *History of the Town and County of Galway* (Dublin, 1820).

Gama, VASCO DA, the greatest of Portuguese navigators, was born about 1469, of good family, at Sines, a small seaport in the province of Alemtejo. He early distinguished himself as an intrepid mariner, and, after the return of Bartolomeu Diaz in 1487 from his venturesome voyage past the Cape of Storms had determined King João to make explorations farther, was appointed by his successor, Manoel the Fortunate, to command an expedition of four vessels, manned with 160 men. At the same time he was furnished with letters to all the potentates he was likely to visit, among them the mythical 'Prester John,' then supposed to be reigning in splendour somewhere in the east of Africa. The little fleet left Lisbon 8th July 1497, but was vexed by tempestuous winds almost the whole way, and was four months in reaching St Helena Bay. After rounding the Cape, in spite of dreadful storms and mutinies among his crews, he made Melinda early in the following year. Here he found a skilful Indian pilot, next steered eastwards across the Indian Ocean, and arrived at Calicut, in India, on the 20th of May 1498. The zamorin or ruler of Calicut was at first merely suspicious, but soon became, at the instigation of the jealous Arab merchants, actively hostile, until at length Da Gama had to fight his way out of the harbour. In September 1499 he cast anchor at Lisbon, and was received with great distinction, and created a noble.

King Manoel immediately despatched a squadron of thirteen ships, under Pedro Alvarez Cabral, to establish Portuguese settlements in India. Sailing too far westwards he discovered the unknown coast of Brazil, and, after losing half his ships, at length made Calicut, where he founded a factory. Here, after Cabral's departure, the forty Portuguese who had been left behind were murdered by the natives. To avenge this insult and secure the Indian Ocean commerce the king fitted out a new squadron of twenty ships, which set sail under Da Gama's command in 1502, founded the Portuguese colonies of Mozambique and Sofala, bombarded Calicut, destroyed a fleet of twenty-nine ships, and extorted a peace with suitable indemnification, and reached the Tagus with thirteen richly-laden vessels before the close of December 1503. Da Gama had effected his purpose with marvellous despatch, but not without cruelties that have left an indelible stain upon his name. For the next twenty years he lived inactive at Evora, while the Portuguese conquests in India increased, presided over by five successive viceroys. The fifth of these was so

unfortunate that King João III., the successor of Manoel, was compelled in 1524 to summon Da Gama from his seclusion and despatch him, with the title of viceroy and a fleet of thirteen or fourteen vessels, to the scene of his former triumphs. His firmness and courage succeeded in making Portugal once more respected in India, but while engaged in his successful schemes he was surprised by death at Cochin in December 1525. His body was conveyed to Portugal, and buried with great pomp at Vidigueira. The great achievement of Vasco da Gama is one of the most important points in the history of modern civilisation, second only in importance to the discovery of America by Columbus but a few years before. His story gave its impulse to the enthusiasm of Camoens, whose *Lusiads* would alone have given the subject immortality. See the *Three Voyages of Vasco da Gama*, trans. by Lord Stanley of Alderley for the Hakluyt Society (1869).

Gamaliel (*Gamli'el*, 'my rewarder is God'), a Hebrew name, the most celebrated bearer of which is Gamaliel I., or the Elder (so called to distinguish him from his grandson), probably the one mentioned in the New Testament, at whose feet St Paul learned the 'law.' Both here and in the Talmudical writings he appears only in his capacity of a teacher of the law and a prominent Pharisaic member of the Sanhedrim; of the circumstances of his life we know little but that he taught early in the 1st century, and that he interposed on behalf of the apostles of Christianity. He was the son of Simeon, and grandson of Hillel (q.v.). Laws respecting the treatment of the Gentiles, due directly or indirectly to Gamaliel's influence, show unusual breadth and toleration. The Gentile, it was enacted, should henceforth, like the Jew, be allowed the gleanings of the harvest-field; of his poor the same care was to be taken, his sick were to be tended exactly as if they belonged to the Jewish community. Tolerant, peaceful, as free from fanaticism on the one hand as on the other from partiality for the new sect, he seems to have placed Christianity simply on a par with the many other sects that sprang up in those days and disappeared as quickly; and he exhorts to long-suffering and good-will on all sides. When Gamaliel died (about seventeen years before the destruction of the Temple) 'the glory of the law' was said to have departed. The story of his conversion to Christianity, we need scarcely add, is as devoid of any historical foundation as that of the transmission of his bones to Pisa. Yet his name has been placed on the list of Christian saints, his day being the 3d of August.

Gamba, Viol da. See VIOL.

Gambetta, LÉON MICHEL, French statesman, was born at Cahors, of Genoese-Jewish extraction, October 30, 1838. After studying law, he became a member of the Paris bar in 1859. He soon attracted attention by his advanced liberal views, and in 1868 acquired still greater celebrity by his striking speech in the Baudin case, and his denunciations of the arbitrary measures of Louis Napoleon. In 1869 he was elected deputy by the Irreconcilables for both Marseilles and Belleville, and took his seat for the former constituency. Early in the session of 1870 he protested against the imprisonment of his friend Rochefort, attacked the ministry of Émile Ollivier, and predicted the approaching advent of the Republic. Upon the surrender of Napoleon III. at Sedan, Gambetta proposed the deposition of the imperial dynasty, and he was one of the proclaimers of the Republic, September 4. On the 5th he became minister of the Interior in the Government of National Defence, and at once took vigorous measures for opposing the Germans and defending Paris. The capital, however, was invested, and in October he escaped in a balloon in order to join his colleagues at Tours. Here, and subsequently at Bordeaux, he assumed the general conduct of public affairs, and for five months was Dictator of France. With marvellous energy and undaunted courage he called army after army into being, and sent them against the German hosts, but in vain. The trumpet-tones of his appeals were heard throughout the whole of France, and at one moment it seemed as though success must attend the efforts of the indefatigable minister; but the surrender of Metz by Bazaine—which Gambetta denounced as an act of treason—crushed all hopes of deliverance for France. Nevertheless, Gambetta continued the struggle, and even when Paris succumbed to the invaders he demanded that the war should be carried on *à l'outrance*, and that an assembly should be elected for that purpose. When his colleagues in the capital had concluded an armistice, and called upon the electors without regard to party to elect a constituent assembly, Gambetta issued a decree at Bordeaux, January 31, 1871, disfranchising all functionaries of the Empire and all members of royal dynasties. This decree was repudiated by the government at Paris, whereupon Gambetta resigned, and for some months retired into Spain. But he became more popular than ever with the masses, and was elected to the National Assembly by ten departments. He took no part in the earlier sittings of the Assembly or in the suppression of the Commune. In July he was re-elected for the departments of the Seine, Var, and Bouches-du-Rhône, and took his seat for the last-named department. The *République Française* appeared in November 1871 as his representative organ.

The second part of Gambetta's political career began after the fall of the Commune, when he was accepted as the chief of the advanced Republicans. Early in 1872 he traversed the south of France, exciting the enthusiasm of the populace, and in the ensuing September he formulated the Republican programme at Grenoble, severely attacking M. Thiers and the National Assembly, and demanding the removal of the government from Versailles to Paris. He had now become the most prominent Frenchman of the time. The National Assembly voted the republican form of constitution in February 1875, and two months later Gambetta delivered his famous speech at Belleville, defending the Republicans from the attacks of the Irreconcilables. The '*fou furieux*' of M. Thiers now developed into the leading exponent of Opportunism. He opposed the vote of the Assembly establishing *scrutin d'arrondissement*, and after the elections of 1876 became president of the budget committee. A constitutional conflict arose in May 1877, when the Duc de Broglie took office in the hope of restoring the monarchy. A civil war seemed imminent, but, owing chiefly to the zeal and activity of Gambetta, such a catastrophe was averted, and the Republic firmly established. The chamber censured the ministry by 363 to 158 votes, and a dissolution was ordered. Gambetta exclaimed, 'We go out 363, and 363 we shall return,' and his prophecy was fulfilled to the letter. Marshal MacMahon refrained from pushing matters to an extremity, and the royalist contest was abandoned. Gambetta was summoned before the Eleventh Correctional Tribunal of Paris for having declared respecting MacMahon at Lille, '*Il faudra ou se soumettre, ou se démettre.*' He was condemned on October 24 to three months' imprisonment and a fine of 4000 francs. Two months later he was re-elected for Belleville. The

contest between the deputy and the president ended in the triumph of Gambetta—who did not go to prison—and the resignation of MacMahon. M. Grevy was elected president, but Gambetta was regarded as the saviour of the Republic. Though now the most powerful statesman in France, and the maker and unmaker of cabinets, he declined to take office, on the ground that no strong government was possible until the elective *scrutin de liste* had been adopted. In 1878 Gambetta fought a duel with M. de Fourtou, an ex-minister, whom he had charged with falsehood, but the hostile encounter had a harmless termination. Shortly afterwards Gambetta accepted the presidency of the chamber, a post which he held till the autumn of 1880. In November of that year the Ferry ministry resigned, being discredited by the mismanagement of the Tunis expedition. Gambetta was called upon to form a cabinet, and succeeded, after much difficulty. But, as it was practically a government of one, opposition to the new premier set in, and when he produced his scheme for the revision of the constitution in January 1882 the chamber rejected the *scrutin de liste* proposal by 305 to 110 votes, and Gambetta immediately resigned. He afterwards acted as chairman of the military committee, but took little part otherwise in public affairs.

On 26th November, as he was handling a revolver at his residence at Ville d'Avray, the weapon accidentally went off, and the bullet entered the palm of his hand and came out at the wrist. A report subsequently prevalent asserted that the wound was inflicted by a woman's hand. In any case, no serious consequences were apprehended, and in spite of sinister rumours he was reported convalescent on 13th December. The wound, however, took an unfavourable turn; internal inflammation set in, and the patient suffered terrible agony. Yet he was conscious and self-possessed until the end, and expired on the last day of the year 1882, being only forty-four years of age. He was buried at Nice, France mourning for him as one of the greatest of her patriots and sons, and as one who, by his dauntless will, energy, and eloquence, had indelibly impressed himself upon one of the darkest periods of her national history. Reinach has edited his *Discours Politiques* (10 vols. 1880–85), and written a Life of him (1884).

Gambia, a river of Western Africa, the more southerly of the two great streams of Senegambia, enters the Atlantic after a course estimated at over 1400 miles, by an estuary which in some parts measures nearly 27 miles across, but contracts to little more than 2 at the mouth (Bathurst, 13° 24′ N. lat., 16° 36′ W. long.). It is navigable from June to November for vessels of 150 tons up to Barraconda, about 400 miles from the sea. The whole of the *lower* river, extending to Georgetown, 180 miles from Bathurst, is British waters. Below Barraconda the river overflows its banks in the rainy season, and, like the Nile, leaves a fertile deposit of mud.—The British settlement of Gambia occupies the banks of the river as far up as Georgetown, though not continuously. Its actual area is about 69 sq. m., embracing St Mary's Island, a sandbank about 3½ miles long by 1¼ broad, mostly covered with low swamps, but containing Bathurst (q.v.); British Combo, on the mainland opposite; Albrida, on the north bank; the Ceded Mile; and M'Carthy's Island, with Georgetown. The climate is officially described as only 'fairly healthy during the dry months.' Besides the weaving of cotton into native cloths, there are manufactures of vegetable oils and bricks, and some boat-building. The staple product is the groundnut, which is exported to the south of Europe for the extraction of oil, although this trade has declined since 1858. Other products are hides, rice, cotton, beeswax, kola nuts, and india-rubber, and there is an active entrepôt trade with the neighbouring French settlements in cotton goods, spirits, rice, kola nuts, and hardware. The imports have an annual value of from £150,000 to £175,000; the exports from £120,000 to £200,000. The trade is mainly in French hands. The revenue (not always covering the expenditure) fluctuates from £25,000 to £30,000. Formerly a dependency of Sierra Leone, the settlement was created an independent colony in 1843, and became a portion of the West African Settlements in 1876; in 1888 it was made a separate government. The settlement is connected with Europe by telegraph cables, and the Liverpool mail-steamers call fortnightly. Pop. (1894) 14,978, including 62 Europeans, 2385 native Christians, and 5300 Mohammedans. Except for the British strip (total area, 2700 sq. m., pop. 50,000), the basin of the Gambia is French territory. See SENEGAMBIA.

Gambier, GAMBIR, or PALE CATECHU, is an important article of commerce, used to a small extent medicinally as an astringent, but very largely in tanning and dyeing. It is an earthy-looking, light-brown substance, often in small cubes or in compact masses. It possesses no odour, but has a bitter, astringent taste, subsequently becoming sweetish. Under the microscope it is seen to consist of small acicular crystals. It is prepared in a very rude manner from the young leaves of the *Uncaria Gambir*, a native of the countries bordering the Straits of Malacca. As the plant, which grows to 8 or 10 feet, constantly produces young leaves, the manufacture is carried on throughout the year. The leaves are boiled in water, squeezed, and the decoction evaporated to a thick consistence, when it is poured into buckets, and treated in a curious manner. The workman takes a stick, which is moved up and down in the mass, and, as the gambier dries on it, it is scraped off and allowed to harden. It is asserted that stirring the mass does not produce an equally good article.

Gambier, JAMES, BARON, Admiral, was born in the Bahamas, 13th October 1756, entered the navy, and off Ushant fought with distinction as commander of the *Defence* under Lord Howe in 1794. As admiral he commanded the British fleet at the bombardment of Copenhagen in 1807, and was rewarded with a peerage. At the battle of Aix Roads in 1809 he refused to act on the advice of Lord Cochrane (see DUNDONALD), was tried by court-martial, and 'most honourably acquitted.' He attained the high rank of Admiral of the Fleet in 1830, and died 19th April 1833. The *Memorials* of him (1861) by Lady Chatterton has no value.

Gambier Islands, or MANGARÉVA, a Polynesian group of six larger and several smaller islands, under a French protectorate, in 23° 15′ S. lat. and 135° W. long. Area, 15 sq. m.; pop. 450, all Catholics.

Gambier-Parry. See MURAL DECORATION.

Gambit. See CHESS.

Gambling, or GAMING, may be defined as the practice of playing for a money stake games depending solely on chance, like *roulette*, for instance, or those other games into which the element of skill enters, as in the cases of whist or billiards. Gambling was not countenanced by the Roman law; but a curious exception seems to have been made when, by the terms of the wager, the loser had to provide refreshment or hospitality for the winner. Before the passing of an enactment for the restriction of games and gaming, all games like cards and dice, and all exercises, were legal at common law so long as they were indulged in for recreation and played fairly and without

cheating; and the reason assigned for the favour which gambling finds with the majority is not inaptly stated by a writer in the time of Queen Anne. He says: 'I cannot attribute it to a principle of mere avarice in many, though in most I fear it is so, but rather think the contingency of winning and losing and the expectations therefrom are diverting. I conceive there would be no pleasure properly so called if a man were sure to win always. It 's the reconciling uncertainty to our desires that creates the satisfaction.' Among the old writers the subject of gaming appears to have taken a wide scope, and to have been mixed up with games which might more properly be ranked under the head of athletic exercises, as well as with what our ancestors were pleased to regard as sport; and the same classification appears to have taken place in some of the older statutes. Statutory restrictions upon games and gaming go back as far as the 12th year of the reign of Richard II., and these were followed by the 17th of Edward IV. and others which made certain games illegal; but in giving an outline of the chief statutes connected with gaming it is unnecessary to go further back than the year 1541, as the comprehensive Act 33 Henry VIII. chap. 9 prohibited tables, tennis, dice, cards, bowls, dash, loggats, and other unlawful games when played under certain conditions. This statute, however, like one of Edward III.'s proclamations, had for its immediate object the encouragement of archery, and professes to have become law in consequence of a petition being presented by the bowmen of this country and those engaged in the manufacture of implements of archery.

For some time there was no material alteration in the laws affecting gaming; but Charles II. desiring to prevent his subjects from becoming 'lewd and dissolute,' an act was passed (16 Car. II. chap. 7) to put down 'deceitful, disorderly, and excessive gaming.' The statute enacted that all persons winning by fraud over certain games and amusements therein specified were to forfeit treble the value of their winnings; that every one losing more than £100 on credit at the games before mentioned was to be discharged from the obligation to pay it; that all securities given for the debt were to be void; and that the winner was to forfeit treble the sum he won in excess of £100. This act of Charles II.'s is said to have been passed in consequence of the vast sums of money won and lost over a match on the turf in which two horses belonging to Mr Tregonwell Frampton and Sir Charles Strickland respectively were the competitors. Before the match came off Frampton's trainer meeting Hesletine, who had charge of Sir C. Strickland's horse, proposed to run a private trial, and at Sir Charles's directions Hesletine assented. Each jockey at the instigation of his master carried 7 lb. more than the specified weight under the idea that he had stolen a march on his opponent. Frampton's horse won the trial after a close race, and his party argued that as he won with the worst of the weights he would achieve an easy victory at even weights. The other side argued that, as their horse was beaten so little when handicapped with an extra 7 lb., he would turn the tables in the race, which, however, ended as the trial had done. So much money changed hands that, as already mentioned, the above act was passed. Passing over for the present the statutes aimed at unlawful games, it is sufficient to notice that by the first licensing act (25 Geo. II. chap. 36) gaming-houses are forbidden; but during the long reign of George III. the government does not appear to have troubled itself much about gaming and gamesters, and we may pass on to the 8 and 9 Vict. chap. 109, the 18th section of which renders void all contracts by way of gaming and wagering. The 16th and 17th Vict. put down betting-houses; and the 31st and 32d Vict. chap. 52 (the Vagrant Act) enacts that every person betting, wagering, or gaming in any open or public place with any table or instrument of gaming shall be deemed a rogue and vagabond, and, upon conviction, shall be punished as the act directs. It was under this act that the proprietors of the 'Pari-mutuel' were punished (see BETTING). In spite of the statutes forbidding gaming-houses they have been carried on, and during the year 1889, besides several other cases, the police made raids upon the Field Club, in Park Place, St James's, and another in Maiden Lane, Strand, the proprietors of which were fined £500 each, substantial penalties being also inflicted upon some of the officials.

It has been mentioned above that the statute of Henry VIII. made certain games illegal; and so long ago as the time of Edward IV. certain other games, like 'Holy Bowls,' were unlawful. In 1618, however, James I. made a declaration that the dancing of men and women, leaping, May games, and some other forms of amusement should be permitted, and Charles I. allowed feasts of dedications of churches, called wakes, to be indulged in; but the 18th Geo. II. chap. 34 put a stop to Roulet, or Roly-poly, a game which could have no connection with modern *roulette*, because the act speaks of Roulet 'or any other game with cards or dice.' It will be noticed that the statute passed in the time of Henry VIII. was not repealed at the time Queen Victoria came to the throne, and it was not until the year 1845 that bowls, quoits, tennis, and many other games of skill could legally be played in any public alley or ground. In 1845, however, it appears to have struck the ruling powers that it was a little incongruous to retain in the statute-book an act which both prohibited games of skill, and ordered people to shoot with bows and arrows, so in that year the 8th and 9th Vict. chap. 109 was passed, and a great deal of the act of Henry VIII. was repealed; and, to sum up, it may be pointed out that racing of all kinds, what are known as athletic sports, all games like cricket, croquet, quoits, &c., all of what are known as 'parlour pastimes,' and most games at cards are now legal. The exceptions are Ace of Hearts, Bassett, Dice (except Backgammon), Hazard, Pharaoh (or Faro), Passage, Roly-poly. It will be observed that neither playing cards for money nor betting are illegal *per se;* they only become so when indulged in under certain conditions. There is nothing unlawful in playing cards in a private house, or whist in a club; but to frequent a gaming-house is not allowed. Again, a man does not break the law because he makes a bet on credit in his house, on a racecourse, or at Tattersall's if he is taken to be a member; but should he stake his money and make his bet at the bar of a public-house or on the street he renders himself liable to be proceeded against.

Lotteries, which are first heard of in England in 1569, were for some time legal, and at last so many private and cheating ones became mixed up with the more honourable affairs that legislation became necessary, and the 10th and 11th William III. chap. 17 was passed for the purpose of suppressing them by declaring them public nuisances; though there was still a loophole, for lotteries might be carried on 'under colour of patents or grants under the great seal.' This act, however, did little or nothing to check the evil, nor do subsequent enactments appear to have been more efficacious. State lotteries were altogether put an end to in 1826, from which year we hear very little of lotteries, as the laws against them are now strictly enforced. Raffles and sweeps are illegal, being nothing more than lotteries; yet every club

has its Derby sweep; and when Convocation met in the summer of 1889, and denounced the tendency of all classes towards indulging in betting and gaming, one or two of the speakers spoke in extenuation of lotteries and raffles at fancy fairs organised for charitable or religious objects. Art unions are specially exempted from the operation of the statutes against lotteries by the 9th and 10th Vict. chap. 48, which declares that voluntary associations for acquiring works of art which are afterwards distributed by lot are to be deemed legal after a royal charter has been obtained. Gambling which takes the form of speculating in stocks and shares has long been common, but at present a certain number of outside brokers –men, that is to say, who are not members of the Stock Exchange – are offering every facility to those desirous of indulging in the hazardous pastime. By staking with the broker one per cent. of the amount it is determined to nominally expend, the investor can give his orders. Thus, in the words of the advertisements, £5 (called 'cover') commands £500 of stock. Should the stock fall sufficiently to exhaust the cover, the transaction is at an end; the investor loses his cover, which goes into the pocket of the broker. If the stock rises in the market the investor can claim the difference between its present value and the price at which he bought, or nominally bought, for no stock changes hands in these transactions. No brokerage is charged, and, as palatial offices are occupied, it would appear that a very great majority of speculators lose their money. This system when analysed is neither more nor less than betting upon the rise and fall, the broker being to all intents and purposes a bookmaker.

In the United States, keeping a gambling-house is indictable at common law as injurious to morals; and most states and territories have passed laws against gambling, in some of them severe and stringent. Yet till 1880 gambling was exceedingly common and open throughout the United States; and it was left to societies for the suppression of vice, especially in New York, to stir up the authorities to put the laws in force. In 1881–84 prosecutions and convictions were very numerous; in 1885 almost all the chief cities in the Union followed the example of New York. Prussia, Saxony, Brunswick, Mecklenburg-Schwerin, and Hamburg still have state lotteries.

See Betting, Monaco, Baden-Baden, and articles on the various games; also Frederick Brandt, *Games, Gaming, and Gamesters's Law* (new ed. 1873); an article in the *Quarterly* for January 1889; a bibliography of books on gambling in *Notes and Queries* (1889); and John Ashton's *History of English Lotteries* (1894).

Gamboge, or Camboge, a gum-resin, used in medicine and the arts, the produce chiefly of *Garcinia Morella* (*Gambogia gutta* or *Hebradendron gambogioides*), a tree of the order Guttiferæ (sub-order Clusiaceæ), a native of Cambodia (hence the name), Ceylon, Siam, &c. The gamboge-tree attains a height of 40 feet, has smooth oval leaves, small polygamous flowers, and clusters of sweet and edible fruits. When the bark of the tree is wounded the gamboge exudes as a thick, viscid, yellow juice, which hardens by exposure to the air. It is generally collected in a joint of bamboo, and a single tree will yield sufficient to fill three joints 20 inches in length and 1½ inch in diameter. From this cause it is found in commerce in the form of sticks or cylinders having the markings of the bamboo on the outside. When of good quality it is of a rich, orange-brown tint, and should not show a rough granular surface when broken. Since yellow is a colour sacred to Buddha, gamboge is in much request in Singhalese temples, alike for vestments and decorations. The finest gamboge comes from Siam.—*American gamboge*, which is very similar, and is used for the same purposes, is obtained from *Vismia guianensis*, and other species, shrubs of the order Hypericinæ. Gamboge occurs in commerce

Gamboge (*Garcinia Morella*).

in three forms: (1) in *rolls* or *solid cylinders;* (2) in *pipes* or *hollow cylinders;* and (3) in *cakes* or *amorphous masses.* The first two kinds are the purest. Good gamboge contains about 70 per cent. of resin and 20 per cent. of gum, the remainder being made up of woody fibre, fecula, and moisture. Medicinally it acts as a violent purgative, seldom administered alone. It is employed in water-colour painting, in the staining of wood, and in the formation of a golden lacquer for brass. It can be readily bruised, forming a brilliant yellow, slightly inodorous powder, and possesses a disagreeable acrid taste.

Gambrinus, a mythical king of Flanders, to whom is ascribed the invention of beer. His figure is familiar in German beer-cellars, often seated astride a cask, a foaming tankard in his hand.

Game-laws. Since primeval days man has been a carnivorous animal, and has depended for his sustenance largely upon the flesh of the beasts of the field. At first, doubtless, the only thought was of the capture and destruction of animals whose flesh was agreeable to the taste, not of their preservation and protection for future use. But it is probable that at a very early age domestication was resorted to in order to meet the scarcity caused by the depletion of the forests and the increased wariness of the animals. There are, however, many animals which, though suitable for food, cannot readily be domesticated, and these still remained the objects of the chase in their natural wild condition. Doubtless for a time these latter were still mercilessly hunted down, but gradually the necessity came to be recognised of husbanding the stock even of wild animals against the future. The analogy of the animal kingdom suggests that the pleasures of the chase were just as keen amongst the nomad tribes in the primeval forests as amongst modern British sportsmen; but the primary object then was not the enjoyment of sport, but the collection of a supply of food, and the value of the wild animals was mainly an economic one. But gradually, as civilisation advanced, as cultivation increased, and other sources of food-supply were multiplied, the value of wild animals as food diminished, and protection came to be accorded to them rather as objects of sport than

as a valuable food-provision. This condition had already been reached in England with regard to birds and quadrupeds when the Forest Laws were first promulgated, but the economic as superior to the sporting value of fresh-water fish long held its ground, and indeed still does so to a certain extent in the case of some of the larger rivers. Notwithstanding, however, the small value of game as an article of food in proportion to its value as an object of sport, there is still a utilitarian instinct in the pursuit of many kinds of game; the edibility of the animal is a condition of the enjoyment of sport; nothing grieves a sportsman more than to lose an animal he has killed; and no sportsman would go out to shoot old rooks or blackbirds, although these would supply just as difficult shooting as partridges and pheasants.

By the common law, both of England and of Scotland, following that of Rome, wild animals in a state of nature are common to mankind, and are not proper subjects of private ownership. But at an early stage it was recognised that a free right of hunting was incompatible with the preservation of game in such numbers as to afford ample sport to the monarch and the nobles. Accordingly a series of laws known as the Forest Laws (q.v.) were enacted, whereby certain districts of country were set apart for sport to the sovereign and his donees; and effective provision was made to reserve the exclusive right of pursuing game within the protected areas. But the increase of population and the enclosure of large parts of the country rendered protection necessary for the areas outside of the royal forests if the game was not to be totally extirpated, and the result has been a series of enactments known as the Game-laws.

'Game' includes hares, pheasants, partridges, grouse, black-game, ptarmigan, and bustards. But, in addition, there are a number of animals to which one or other of the game-statutes extends protection. These are rabbits, deer, roe, woodcock, snipe, quail, landrails, and wild duck.

Although there is no private property in wild animals, it is now fixed partly by statute, partly by consuetudinary law as interpreted by the decisions of the courts, that the right to pursue or take game is a private privilege. In the absence of express stipulation this privilege belongs in England to the occupier, in Scotland to the owner of the soil. It has sometimes been represented that, although a wild animal is not private property, the moment it is taken or slain it becomes the property of the person on whose land it is taken or slain. This is not strictly accurate, for if it were so then the poacher who picks up the partridge he has shot would be guilty of theft, which in the present state of the law he certainly is not. On the other hand, there is no doubt that the occupier or owner of the soil is entitled to recover the game from the poacher. The law, therefore, would seem to be most accurately expressed by the statement that the occupier or owner of the soil has a right to claim any game taken or slain upon his land.

The statutory provisions with reference to game are of four kinds—viz. (1) laws for the punishment of poaching; (2) close time provisions for the protection of game during certain seasons of the year; (3) provisions to enable farmers to protect their crops against the ravages of ground-game; (4) revenue and license laws imposing government duties upon the exercise of a right to take or to deal in game.

(1) *Poaching.*—The most important of the acts at present in force against poaching are the Day Poaching Act, 1831 (Scotland, 1832); the Night Poaching Acts, 1828 and 1844; and the Poaching Prevention Act, 1862. These statutes impose penalties for trespass by night or by day in pursuit of game, and for the illegal possession of game; and contain stringent provisions for the detection and punishment of offenders. Night-poaching is treated as a much more serious offence than day-poaching, the reason being that night-poaching, especially by large bands, is apt to lead to acts of serious violence. See the article POACHING.

(2) *Close Time.*—This is regulated in England by the Day Trespass Act, 1831, and in Scotland by the Preservation of Game Act, 1772. The close time in England is, for partridges, from 1st February to 1st September; for pheasants, from 1st February to 1st October; for black-game, from 10th December to 20th August (1st September in Somerset, Devon, and the New Forest); for grouse, from 10th December to 12th August; and for bustards, from 1st March to 1st September. The seasons in Scotland are the same, except that bustards are not mentioned in the act. By the Day Trespass Act (adopted for Scotland by the Game Certificates Act, 1860) it is also made illegal to deal in game more than ten days after the commencement of close time. It was recently held that this does not apply to game imported from abroad.

(3) *Protection of Crops.*—By the Ground Game Act of 1880 an inalienable right to destroy hares and rabbits found upon his land is given to the occupier. In order to minimise the interference with legitimate sport, it is provided that steel traps shall not be used, except in rabbit holes; that the occupier shall not be entitled to delegate the right to shoot to any person other than one member of his household, specially authorised by him in writing; and that the occupier of moorlands shall be entitled to take hares only between 11th December and 31st March.

(4) *Revenue and License Laws.* The different duties and licenses in connection with taking and the dealing in game are embodied in a series of revenue statutes, which it is unnecessary to enumerate. A game-license for the whole year costs £3; but a license may be taken for half a year to 1st November, or for half a year thereafter at £2; or a license may be taken for a period of fourteen continuous days at £1. A gamekeeper's license costs £2. Dealers in game must annually obtain a license from the justices, upon production of which and payment of £2 of duty they obtain an Inland Revenue license to deal in game.

Strong exception is taken to the game-laws by many. It is urged that the provisions for the detection of poachers are harsh and inquisitorial, and there can be no doubt that the difficulty of detecting this offence (arising mainly from the impossibility of identifying the articles taken) has led to the enactment of certain provisions of a very stringent character. Although, however, the provisions are harsh on their face, it may be doubted if it has often happened that any person who had come properly in possession of game, and was able to give an honest account of it, has been subjected to serious inconvenience by the operation of these laws. A much more formidable objection is that the laws are out of harmony with the general sense of a large section of the community; that in the eyes of many respectable persons and of most poachers poaching is no crime; and that many men have by the operation of these statutes been made criminals who would scorn to stoop to any act of ordinary dishonesty. There is force in this objection, for there can be no doubt that, whatever be the explanation, poaching is looked upon by many in quite a different light from any other offence. Prison governors and chaplains tell that they never find a poacher penitent or willing to admit that he has done wrong. The community of the right to game, either as a primitive tradition or as a legal theory handed down from the Roman

law, prevails singularly enough in the popular mind contrary to the constant practice of centuries.

The game-laws are, on the other hand, defended on the ground of vested proprietary interest, to which great commercial value now attaches, and as affording protection against trespass, which would lessen the agricultural value and the amenity of property. But the strongest plea in favour of the laws affording protection to game is that without such protection game would soon cease to exist. In an enclosed and thickly-settled country, amidst a crowded population devoted to sport, game would soon become extinct if the public enjoyed a free right to pursue it. In Switzerland, where the only protection is a close time, notwithstanding the numerous natural retreats for wild animals, game is all but extinct; indeed, it is considered a good day's sport for a large party if a single hare is killed. Again, the concession to the occupier of an inalienable right to ground-game by the Act of 1880 has already led to the hare becoming virtually extinct in many parts of Great Britain. In the opinion of some, no doubt, the total extirpation of game would be a benefit to the country; but, on the other hand, it is urged that not only does the pursuit of game give zest and variety to rural life, and afford healthful enjoyment in the autumn to a considerable section of the community, many of whom are engaged in sedentary occupations for the greater part of the year, but that it also leads to the diffusion of much wealth throughout the poorer districts of the country, and keeps a great deal of money at home which would otherwise be spent abroad.

In the United States any one is free to capture or kill wild animals, subject to the laws of trespassing; save where, as in several states, laws have been passed protecting game during certain seasons, so as to prevent its extirpation.

Perhaps the most feasible suggestion which has yet been made for a reform of the game-laws without withdrawing protection from game is that all the statutes against poaching should be repealed, and a simple provision substituted whereby game should be declared to be the property of the person on whose lands it is found. The effect of this would be to render the taking of game theft, and trespass in pursuit of game an attempt to steal. It is urged in favour of this change that it would simplify the law, remove many harsh and anomalous provisions from the statute-book, and tend to disabuse the popular mind of that theory of the common right to take game which creates disaffection with restraining law. In an unenclosed and sparsely-peopled country wild animals roam at freedom and care for themselves, and they are not therefore appropriate subjects of private ownership. But in an enclosed, highly-cultivated, and thickly-peopled country, game is just as much dependent for its existence as are flocks and herds upon the protection and care of the owners or occupiers of the soil, and may therefore, it is said, appropriately be made the subject of private property of those who maintain it. See Alex. Porter, *The Gamekeeper's Manual* (2d ed. Edin. 1889).

Fresh-water Shrimp (*Gammarus pulex*), magnified.

Gaming. See GAMBLING.

Gam'marus, a genus of Amphipod Crustaceans, including numerous fresh-water and marine species. One species (*Gammarus pulex*), sometimes called the 'fresh-water shrimp,' is extremely common in quickly-flowing brooks. It is a tiny creature, about half an inch long, but so abundant that few can have missed seeing it. It generally keeps near the bottom, swims on its side, with a kind of jerking motion, and feeds on dead fishes, &c. In quiet water *G. fluviatilis* is common, and *G. locusta* is very abundant among seaweeds along all European coasts. Blind species of the allied genus Niphargus are found in many caves and wells.

Gamrun. See GOMBROON.

Gamut, a name for the musical scale—see MUSIC, SCALE (MUSICAL). Guido of Arezzo, in the 11th century, marked the last of the series of notes in his musical notation with a *g* or the Greek letter γ (*gamma*), the name of which came to be used for the whole scale—often in a French form *gamme*. *Gamut* is compounded of this word and *ut*, the beginning of a Latin hymn used in singing the scale. See SOLFEGGIO.

Gand. See GHENT.

Gandak (the *Great Gandak*; the Little Gandak being an unimportant tributary of the Gogra), a river of India, rises in the Nepal Himalayas, in 30° 56′ N. lat. and 79° 7′ E. long., flows south-west to British territory, and then south-east, forming for some distance the boundary between the North-west Provinces and Bengal, and enters the Ganges opposite Patna. Its banks rise above the level of the plains it passes through, and inundations are frequent.

Gandamak, a village of Afghanistan, between Cabul and Peshawar, where, during the retreat from Kabul in 1842, the last remnant of the British force was massacred, only one man making his escape. Here also a treaty was signed with Yakub Khan in 1879. See AFGHANISTAN.

Gandersheim, a small town of 2507 inhabitants in Brunswick, 30 miles N. of Göttingen by rail. Its famous abbey, dating from 852, continued even after the Reformation to give the title of abbess to the daughters of German princes, and until 1803 was itself a principality. Its abbess, Hrotswitha or Roswitha (*c.* 932-1002), wrote a series of curious dramatic works. See DRAMA (p. 83), and an article by Hudson in the *English Historical Review* (1888).

Gandia, a walled town of Spain, on the Alcoy, 2 miles from the sea, and 47 miles SSE. of Valencia by rail. It contains the old palace of the dukes of Gandia, and has some coast trade. Pop. 7604.

Gando, a Fulah state of the western Soudan, lying west of Sokoto (to which it is tributary), and on both sides of the Niger north of Borgu; it is now, like Sokoto, and the minor states of Ilorin, Nupe, &c., included in (British) Northern Nigeria.—GANDO, 50 miles SW. of the town of Sokoto, is the capital; the chief trading town is Egga (q.v.).

Gandolfo. See CASTEL GANDOLFO.

Ganesa, the most popular among the Brahmanic gods of the second rank, the special deity of prudence, invoked at the commencement of every enterprise, and with whose name every book begins (*namo Ganeçâya*, 'honour to Ganesa'). He is the son of Siva by Parvati, and the leader of his father's train. He is represented with an elephant's head, riding upon a rat, and his figure is found in almost all temples, and also in houses where he has taken the place of the Vedic Agni as domestic guardian.—GANESA is also the name of the author of a 19th-century commentary to the *Lingapurâna* (Bombay, 1858).

Ganga. See SAND-GROUSE.

Ganges, the great river of northern India, prominent alike in the religion and in the geography

of the East, rises in Gahrwal in 30° 56′ 4″ N. lat. and 79° 6′ 40″ E. long., issuing, under the name of the Bhagirathi, from an ice-cave 8 miles above Gangotri and 13,800 feet above the level of the sea. A few miles below Gangotri it receives the Jahnavi, and 133 miles from its source the Alaknanda, from which point the united stream is known as the Ganges. From Sukhi, where it bursts through the Himalayas, it flows south-west to Hardwar, and from thence, by a tortuous but generally south-east course, to Allahabad, where it is joined by the Jumna. From the sacred tongue of land where the two streams meet the great river rolls on in a wide flood, past the holy city of Benares, and across the plains of Behar, fed by the Son, the Gandak, and the Kusi. It then turns sharply to the southward, and, about 20 miles farther on, begins to throw out the branches which enclose the level delta, at a point 220 miles in a straight line from the Bay of Bengal. The main channel, called the Padma or Padda, runs south-east to Goalanda, where it is met by the main stream of the Brahmaputra, and the vast confluence of waters flows in a broad estuary, the Meghna, into the Bay of Bengal near Noakhali. Between this most easterly and the Hugli, the most westerly mouth, lies the delta, with a multitude of mouths and channels. The Hugli or Hooghly (q.v.) is the great channel of navigation (for map, see CALCUTTA). The delta in its upper angle is very fertile, but in the south, towards the sea, the country is a desolate waste of swamps (see SUNDARBANS), intersected by a network of canals. The Ganges has a total length of 1557 (by the Hugli mouth, 1509) miles; its drainage basin embraces over 390,000 sq. m., lying between the Himalaya and Vindhya ranges, and extending east to the mountains which separate Burma from Bengal. Not one of the other rivers of India so deserves the gratitude and homage of the Hindus. In spite of the shoals and rapids that lie above Allahabad, it is in some sense navigable from the point where it enters the lowlands, near Hardwar; and its stream, which never fails in the hottest summer, distributes fertility throughout its course, and even its inundations spread over the fields a rich top-dressing of alluvial silt. The ruined or decayed cities near its banks, however, bear mute witness to the loss inflicted by the constant changes which take place in the river-bed, altering the whole face of the country, as the river deserts old channels for new. But the Ganges is still one of the most frequented waterways of the world: ocean and coast steamers carry goods to Calcutta, and above this city thousands of native boats are employed, even since the development of railways, in transporting heavy goods in bulk, such as timber and bamboos, stone, grain, and cotton.—The Hindustani name *Gangâ*, 'stream,' is according to Max Müller an instance of early Aryan reduplication, from the verb to go—'go-go.'

The Ganges excels all the great rivers of India in sanctity; from the source down to the sea every foot of 'Mother Gangâ's' course is holy ground, to bathe in her waters will wash away sin, to die and be buried on her banks secures free entry to eternal bliss. Gangotri, Hardwar, Allahabad, Benares, and Sagar Island, the most sacred spots, are visited by thousands of pilgrims every year; the great *kumbh* fair, which is held every twelve years, drew nearly 1,000,000 persons to Allahabad in 1882—and these of all Hindu sects, for in the legend of the Ganges the three supreme deities of the Hindu pantheon have part. The earliest form of the legend occurs in the *Rámâyana*, where Gangâ is described as the daughter of the Himalayas, whom Bhagirathi, a prince of Ayodhya (mod. Oudh), after more than twice 30,000 years' solicitation by his father and grandfather, induces Brahma to cause to descend from heaven, that his ancestors, who had been reduced to ashes by Vishnu, might be sprinkled with the sacred waters, and their souls rise to heaven. The ice-cavern whence the river springs is made the matted hair of the god Siva. The story admits of numerous variations, and the *Vishnu-Purána*, which assigns the source to the nail of the great toe of Vishnu's left foot, sums up the river's properties in this sentence: 'This sacred stream, heard of, desired, seen, touched, bathed in, or hymned day by day, sanctifies all beings; and those who, even at a distance of a hundred leagues, exclaim "Gangâ, Gangâ," atone for the sins committed during three previous lives.'—Gangâ is also considered as the mother of the god of war, Kârttikeya (q.v.).

The GANGES CANAL, opened in 1854, is an important irrigation work and navigable channel, extending originally on the right of the Ganges, from Hardwar to Cawnpore and Etawah. Surveyed and begun in 1836–48, and opened by Lord Dalhousie, it has since been greatly extended and improved; and with its 700 miles of main channels and 3000 miles of branches, irrigates great part of the Doab (between the Jumna and Ganges, with both of which rivers it connects), and has been of the greatest service in distributing famine relief. Some 500 miles are available for navigation. The Lower Ganges Canal, an extension of the original canal (now known as the Upper Ganges Canal) to Allahabad, was planned in 1866 and begun in 1873. Its weir and headworks at Narora include a solid wall, 3800 feet long, with forty-two weir-sluices, founded on huge square blocks. The ultimate cost of the entire Ganges Canal was calculated not to exceed about 5 millions sterling.

Gangi, a town of Sicily, 18 miles SSE. of Cefalù. Pop. 11,935.

Ganglion. See BRAIN, NERVOUS SYSTEM. In Surgery, the name is given to an encysted tumour on a tendon.

Gangotri, a square temple, about 20 feet high, erected on the right bank of the Ganges (q.v.), which here forms a small bay, about 10,319 feet above the level of the sea. This spot is regarded by pilgrims as the source of the holy stream, here called the Bhagirathi, which, however, rises 8 miles higher up. The water here is peculiarly sacred, but few pilgrims come so far, and the only dwelling-house in the locality is occupied by the officiating Brahmans, by whom flasks of the holy element are sealed for conveyance to the plains.

Gangrene (Gr. *gangraina*, 'a gnawing'), or MORTIFICATION, is the death of a part of the body, whether external or internal. It is most common in the extremities, especially the feet. Its immediate cause is always arrest or impairment of the supply of blood to the affected part. This may be produced in various ways: (1) by direct mechanical injury, or by extreme heat (burn) or cold (Frost-bite, q.v.); (2) by severe septic inflammation, usually following injury, or attacking a wound; (3) by disease of the blood-vessels of the part, in combination perhaps with weak heart action. The second group includes the most dangerous and fatal forms of gangrene: Cancrum Oris (q.v.), phagedæna, and hospital gangrene, now happily much less common than they once were. The third includes gangrene occurring as a result of poisoning by ergot of rye, of diabetes, old age, &c.

The symptoms and appearances attending gangrene vary greatly in different cases. Its onset may be sudden or gradual; it may at once become limited, or it may have a constant tendency to extend; it may be preceded and accompanied by

great pain, or may only be observed in consequence of the local loss of feeling. But in all cases the loss of vitality is accompanied by loss of natural warmth, of sensibility and of motion in the affected part, and by a change in its appearance. It may either become moist and swollen, or dry and shrivelled; and its colour may be either dark purple or greenish, or at least at first pale and waxy. The constitutional symptoms are equally variable: if the part affected be small and not vital, and the gangrene limited, they may be slight and of little importance; otherwise there is generally great depression, with rapid feeble pulse, foul tongue, and other signs of alarming illness.

If the gangrene be limited, a separation takes place gradually between the living and dead parts, and, if the patient survive, the disorganised and lifeless texture is thrown off, and the part heals by Cicatrisation (q.v.) or the formation of a scar, indicating the loss of substance. With regard to treatment, the strength must, generally speaking, be maintained by a nourishing but not too stimulating diet, and the part carefully preserved from external injury and from changes of temperature.

In some forms of gangrene amputation may afford the best or even the only chance of saving the patient's life; in others its results are disastrous, as it is almost certain to lead to fatal extension of the disease. Much care is therefore needed in deciding the question whether surgical interference should be resorted to.

Gangs, AGRICULTURAL, a name specially given to companies of women and boys and girls, brought together for labour in the fen-districts of England, or the low and level tracts which lie south of the Wash. The reclaimed land was mainly cultivated by labourers from the villages, which are numerous on the high ground that borders it. To save expense, the labourers on the reclaimed land here consisted, as much as possible, of women, girls, and boys, working in gangs. An act of 1867 provided that no woman or child was to be employed in the same gang with men or boys, and that no woman or girl was to be employed in any gang under a male gangmaster, unless a woman licensed to act as superintendent was also present with the gang. See FACTORY ACTS.

Gangue (Ger. *Gang*, 'a vein'), the stony matrix in which metallic ores occur. Quartz is the most common gangue, but calc-spar too is very frequent, and barytes or heavy-spar, and fluor-spar are also of common occurrence. Large portions of the gangue are generally worked and submitted to metallurgic processes for the sake of their contents.

Gan-hwuy, or AN-HUI, an eastern inland province of China, intersected by the Yang-tse-Kiang. See CHINA.

Ganister, or CALLIARD, the name given in the Yorkshire coalfield to a hard, close-grained siliceous stone, which often forms the stratum that underlies a coal-seam. Such hard 'seat-earths' are most common in the lower coal-measures; hence these strata in Yorkshire are often termed the 'Ganister Beds.'

Ganjam, a town of Madras presidency, at the mouth of the Rishikuliya, 18 miles NE. of Berhampur (now the capital of the district). Salt is manufactured; and the place is a small port. Pop. 4700. —Ganjam district extends along the Bay of Bengal, in the extreme north-east of the Madras presidency, and is low and fever-stricken, but fertile in grain. Area, 8311 sq. m.; pop. (1891) 1,000,000. Ganjam is also a suburb of Seringapatam (q.v.).

Gannat, a town in the French department of Allier, on the Andelot, 245 miles SSE. of Paris by rail. It has a church dating from the 11th century, and its beer is famous. Pop. 5034.

Gannet (*Sula*), a genus of web footed birds, in the family Sulidæ, and the order Steganopodes, which also includes pelicans, cormorants, and snake-birds. The head is large, the face and neck naked, the bill straight and strong, longer than the head; the toes (4) are long, and all connected

Adult Gannet or Solan Goose (*Sula bassana*).

by the web. The genus includes about eight species, from temperate and cold seas. They fly, swim, and dive well, but are awkward on land; they feed upon fishes, live socially, and nest in crowds on cliffs and rocky islands. The best-known species of Gannet is the Solan Goose (*S. bassana*), whose popular name is akin to the Icelandic *súlan*, 'a gannet,' while it derives its specific title from the Bass Rock of the Firth of Forth. It is common enough in north Europe from March to October, but migrates southwards—e.g. to Gibraltar, in late autumn. Lundy Isle, the Bass Rock, Ailsa Craig, St Kilda, Suliskerry, and Skelig (Ireland) are celebrated British breeding-places. The entire length of the solan goose is about three feet; its general colour milk-white, the crown and back of the head pale yellow, the quill-feathers of the wings black. The young bird, when newly hatched, has a naked bluish-black skin, but soon becomes covered with a thick white down, so that it resembles a powder-puff, or a mass of cotton. When the true feathers appear they are black, with lines and spots of dull white, so that the plumage of the young is very unlike that of maturity. The bird is long-lived, and takes about four years to come to maturity. It extends its flight to great distances from its rocky head-quarters, pursuing shoals chiefly of such fish as swim near the surface, particularly herring, pilchards, and related forms. The presence of a shoal of pilchards often becomes known to the Cornwall fishermen from the attendant gannets. When feeding, the bird always flies against the wind at an altitude of not more than about 100 feet above the surface of the sea. When it espies a fish it instantaneously stops, and with wings *half* distended, stoops and swiftly cleaves the air. When within a yard or two of the surface, and just as it makes the plunge, the wings are clapped close to its sides. Thus the bird enters the water like a bolt. The nests on the rocks are roughly built of seaweeds and marine grasses, and are huddled together on the available ledges and nooks. The single egg has a chalky white colour, and the surface of the shell is rather rough. During incubation

the goose will often allow itself to be touched with a stick without rising from the nest. The number of gannets that annually visit the Bass Rock in the Firth of Forth is estimated at from sixteen to twenty thousand. The young are killed by cliffmen who are lowered down the rock by a rope; they are valued for the sake of their down, flesh, and oil, which bring a profit to the person who rents the rock. On and around the Bass gannets are seen in prodigious numbers, the air around the rock being filled with them, like bees around a hive, and the rock itself whitened by them and their accumulated excrements. The deafening noise of the harsh cries they utter when they are excited or disturbed adds to the impressiveness of their snowflake-like numbers. The flesh is rank and oily; but that of the young, baked, is eaten to a considerable extent in many places, and is even reckoned a delicacy. The eggs are considered by many connoisseurs to be a decided delicacy. They are boiled for twenty minutes, and eaten cold, with vinegar, salt, and pepper. *S. variegata*, extremely abundant in some parts of the southern hemisphere, is said to be the chief producer of guano; and *S. piscator* is the well-known phlegmatic booby.

Ganoids, an order of fishes once very large, but now decadent, being represented by only seven living genera. These are (1) predominantly cartilaginous forms—Acipenser (sturgeon), Scaphirhynchus, Spatularia (or Polyodon), and (2) bony Ganoids—Polypterus, Calamoichthys, Lepidosteus (bony pike), and Amia. On the other hand, the majority of fossil fish in palæozoic times are Ganoids—e.g. Pterichthys, Coccosteus, Cephalaspis, Pteraspis, Rhizodus. The general characters are noted under FISHES.

Gantang Pass, in 31° 38′ N. lat. and 78° 47′ E. long., leads eastward from Kunawar, in Bashahr, into the Chinese territory. Its height is 18,295 feet above the sea, and it is overhung by a peak of its own name, nearly 3000 feet loftier. The place is unspeakably desolate and rugged, and, being devoid of fuel, it is but little frequented.

Gantlet. See GAUNTLET.

Ganymede, the cup-bearer of Zeus, was, according to Homer, the son of King Tros and the nymph Callirrhoë; or, according to others, of Laomedon, Ilus, or Erichthonius. The most beautiful of mortals, he attracted the notice of the king of the gods, who determined to make him his cup-bearer in succession to Hebe, and accordingly despatched his eagle to carry him off to heaven. The Greeks believed that Zeus gave Tros a pair of divine horses as a compensation for his loss, and comforted him at the same time by informing him that Ganymede had become immortal and free from all earthly ills. At a later period he was identified with the divinity who presided over the sources of the Nile. The Greek astronomers likewise placed him among the stars, under the name of Aquarius ('the water-bearer'), in allusion to his celestial function. Ganymede was a favourite subject of ancient art, and in modern time has prompted the genius of Carstens and Thorwaldsen.

Gaol. See PRISONS.

Gaol Delivery, COMMISSION OF, is one of the commissions issued to judges of assize and judges of the Central Criminal Court in England. See ASSIZE.

Gap, the mountain capital of the French department of Hautes Alpes, is pleasantly situated on the Luye, 2424 feet above sea-level, among vine-clad slopes, 47 miles SE. of Grenoble, by a branch line. It has a cathedral (rebuilt since 1866), and some manufactures of silk and cotton fabrics and hats. Population, 8450.—Gap, the ancient *Vapincum*, was formerly a fortress of some importance, and gave the title of Gapençois to the surrounding district of Dauphiné.

Gapes, a disease of fowls and other birds, due to the presence of threadworms or Nematodes (*Syngamus trachealis*) in the windpipe. As a large number (twenty) may be present, the worms cause inflammation, suffocation, and death. The worms breed in the trachea, embryos are coughed up, and, if swallowed by the same or other birds, pass from stomach to air-sacs, lungs, and eventually to the windpipe. As to the external life of the embryo there are two theories: Mégnin, for instance, says that they get into the food when coughed up, and thus pass very directly from fowl to fowl; while H. D. Walker has given strong reasons for suspecting that they pass first into the earth, then into earthworms, and thence into birds. For treatment, see the books named at POULTRY. See also PARASITIC ANIMALS.

Garabit, a point on the railway from Marvejols (Lozère) to Neussargues, about 10 miles S. of St Flour, in the French department of Cantal, where the line crosses a gorge through which the waters of the Truyère run, 401 feet below the rails. The viaduct, the work of M. Eiffel, is built partly of girders and partly of masonry, and has a total length of 1852 feet 6 inches. Where it crosses the river it is supported by an arch, with a span of no less than 541 feet 4 inches. See *Engineering* (1885), and Eiffel, *Le Viaduc de Garabit* (1889).

Garamantes. See FEZZAN.

Garancine, a dyestuff derived from Madder (q.v.). See DYEING, Vol. IV. page 136.

Garay, JÁNOS, Hungarian poet, born at Szegszárd in 1812, lived mostly at Pesth, where he obtained in 1847 a post in the university library, and died 15th November 1853. His study of the masterpieces of German literature and of Vörösmarty bore fruit in numerous dramas, chiefly of historical character: *Csáb* (1835), *Arbocz* (1837), and *Orszgáh Ilona* (1837), as well as long poems, as *Csatar*, an epic (1834), and *Szent Laszlo*, a historical poem (1850). In 1847 he published *Arpádok*, a poetical version of the historical legends of Hungary, and next year *Balatoni Kagylók*, a collection of lyrics. A complete edition of his poems was published by Franz Ney (5 vols. Pesth, 1854), a selection in German by Kértbeny (2d ed. Vienna, 1857), and a Life by Ferenczy (Pesth, 1883).

Garaye, LA, a ruined château in Brittany, 2 miles from Dinan. Its last owners, Claude Toussaint and his countess, in the first half of the 18th century converted it into an hospital, which forms the theme of the Hon. Mrs Norton's poem, 'The Lady of La Garaye' (1862).

Garb, or GARBE (Fr. *gerbe*), a sheaf of any kind of grain. A garb is frequently used in heraldry.

Garcia, MANUEL, vocalist and composer, was born at Seville, in Spain, 22d January 1775. After acquiring a considerable reputation as a tenor singer in Cadiz and Madrid, in 1808 he obtained great success at the Italian Opera in Paris, and afterwards proceeded to Italy, where he was received with equal favour. From 1816 to 1824 he was constantly engaged as a singer, either in Paris or London. In 1825, with a select operatic company, composed in part of members of his own family, he crossed the Atlantic, and visited New York and Mexico. On the road between Mexico and Vera Cruz he was robbed of all his money; and after his return to Paris he was compelled to open a class for singing, as his voice had become greatly impaired by age and fatigue. Many of Garcia's

pupils reached a high degree of excellence, but none equalled his eldest daughter Maria, afterwards Madame Malibran (q.v.). He was less successful as a composer, although several of his works, such as *Il Califo di Bagdad*, were much admired. Garcia died at Paris, 10th June 1832.—PAULINE VIARDOT GARCIA, his second daughter, born at Paris in 1821, acquired a considerable reputation as a mezzo soprano singer, and also composed several operettas and songs.

Garcilaso, a Spanish historian, surnamed the *Inca*, from his mother, a princess of the royal race of the Incas, was son of Garcilaso de la Vega, one of the conquerors of Peru, and was born at Cuzco in 1540. At the age of twenty he proceeded to Spain, and lived the rest of his life at Cordova, where he died in 1616. His first work was *La Florida del Yuca* (1605), an account of the conquest of that country by Fernando de Soto. In 1609 appeared the first, and eight years later the second part of his great work on the history of Peru, entitled *Commentarios Reales, que tratan del origen de los Incas reyes, que fueron del Perú*. Garcilaso's *Royal Commentaries* was translated into English by Sir Paul Rycaut (1688), and by C. R. Markham for the Hakluyt Society (1869).

Garcilaso de la Vega, a great Spanish poet, was born at Toledo about 1503. He early adopted the profession of arms, and gained a distinguished reputation for bravery in the wars carried on by the Emperor Charles V. against the French and Turks, but was mortally wounded while storming a castle near Fréjus, in the south of France, and died at Nice, November 1536, in the thirty-third year of his age. Though prematurely cut off, he lived long enough to win immortality; and, though he wrote little, he revolutionised the national poetic taste of his countrymen. For the short metre of the older romances and redondillas he substituted the hendecasyllabic verse of the Italians. Strangely enough, his poems contain not a trace of military ardour, but are inspired by a tender sweetness and melancholy which appear to have deeply affected his countrymen. 'His sonnets,' says Ticknor, 'were heard everywhere; his eclogues were acted like popular dramas. The greatest geniuses of his nation express for him a reverence they show to none of his predecessors. Lope de Vega imitates him in every possible way; Cervantes praises him more than he does any other poet, and cites him oftener. And thus Garcilaso de la Vega has come down to us enjoying a general admiration, such as is hardly given to any other Spanish poet, and to none that lived before his time.' The best of the numerous editions of his poems is that by Azagra (Madrid, 1765). They have been translated into English by Wiffen (1823).

Garcinia. See MANGOSTEEN.

Gard, a department in the south of France, on the Mediterranean, and bounded on the E. by the river Rhone, with an area of 2245 sq. m., one-third of which is arable. It is watered mainly by the Rhone, and by its tributaries the Gard—from which the department has its name—and the Ceze. Of its surface the north-west is occupied by a branch of the Cevennes, the remainder slopes toward the Rhone and the Mediterranean, the coast being lined by extensive and unhealthy marshes; the climate here is unwholesome, and in summer the heat reaches 104° F. The soil is unequal, the best land occurring in the river-valleys. The famous grapes have almost disappeared before the ravages of the phylloxera; less and less land yearly is retained for vineyards; and the production of wine has sunk to less than a fourth of what it was before 1875. The rearing of silkworms is widely engaged in, and the cultivation of olives and chestnuts is of value. The minerals include coal, iron, argentiferous lead, antimony, marble, and salt; and the department's iron and steel works are important. The department is divided into the four arrondissements of Alais, Nimes, Uzès, and Vigan; the chief town is Nimes. Pop. (1861) 422,107; (1881) 415,629; (1891) 419,388.

Garda, LAGO DI (the *Lacus Benacus* of the Romans), the largest lake of Italy, lies between Lombardy and Venetia, its northern end extending into the Austrian Tyrol. Situated 226 feet above sea-level, it has an area of 115 sq. m., a greatest length of 35 miles, a breadth of 2 to 11 miles, and a maximum depth of 967 feet. Its chief tributaries are the Sarca and Ponale, and it is drained by the Mincio, a tributary of the Po. The scenery is grand: at the north end alpine spurs border the lake on both sides, and descend steeply to its shores, but contain within themselves also many beautiful and fertile valleys; farther to the south the country sinks by gentle slopes to the level of the plain of Lombardy. Along the western shore the mulberry, fig, grape, myrtle, and citron are grown in the sheltered gardens, many of them terraced; olives flourish most on the opposite bank. The clear waters of the lake abound in fish of various kinds. Its surface is studded with many islands, and steamers ply between the principal points. The mild climate in the district of the lake, and the beauty of its vicinity, have caused its shores to be lined with beautiful villas; and the district between Garguano and Salo, called by the people La Riviera, passes for the warmest point in northern Italy. Arco, near the head of the lake, is growing in favour as a winter-resort. The neck of land jutting out for 2 miles from the southern shore, and now called Sermione, is the *Sirmio* praised by Catullus, who had a country-house here, as the 'darling of peninsulas.'

Gardaia, or GHARDAIA, in the Algerian Sahara, stands on a conical hill, in an oasis-valley full of date-palms, 1740 feet above sea-level, and about 200 miles south-west of Biskra. In 1882 a fort was built by the French, who placed a garrison here. Pop. of the oasis (which is the capital of the Wady Mzab) with the garrison, 40,000. Roman ruins show that the oasis was once much more extensive. Just 85 miles to the SE. lies the oasis of Wargla (*Ouargla*), officially associated with Gardaia. An extension hither of the Biskra railway is projected.

Gardelegen, an old town of Prussian Saxony, on the Milde, 28 miles (53 by rail) NNW. of Magdeburg, with a foundry, manufactures of buttons, agricultural implements, &c. Pop. 7340.

Garde Nationale. See NATIONAL GUARD.

Garden City, the Episcopal cathedral town of Long Island, in the barren Hempstead Plains, 19 miles E. of Brooklyn by rail, was laid out as a town of model villas by the New York millionaire, A. T. Stewart, who laid down 27 miles of boulevards, and planted some 50,000 trees. His widow erected here a Gothic cathedral (1877–85), a cruciform building, small, but profuse in detail and ornament, with western spire and circular apse. Close by are the bishop's residence and the cathedral schools, besides other seminaries. Pop. 574.

Gardeners' Garters. See CANARY GRASS.

Gardenia, a genus of Cinchonaceæ, tropical and subtropical trees and shrubs, frequently introduced for their beautiful and fragrant flowers e.g. *G. florida* and *G. radicans* from Japan, and other species from the Cape, where their hard timber also is esteemed. The fruit of other species is used in dyeing silks yellow. The colouring principle is identical with that of saffron (Crocin). The

Indian *G. arborea* and *gummifera* yield a yellow resin. The name was given by Linnæus in honour of Dr Alexander Garden, born in Scotland in 1830, who practised medicine in South Carolina, became eminent as a botanist, and died in London in 1791.

Gardening, or HORTICULTURE, the ordering and management of a garden, differs from agriculture chiefly as being conducted on a smaller scale and with more minuteness, while concerned with a greater variety of subjects. As in a house, so in a garden (though the line is seldom quite distinct), part is devoted to comfort and enjoyment, and the other part to provision for them; the former part forms the pleasure-ground, and the latter the kitchen-garden. Leaving vinery, pinery, hothouse, greenhouse, &c., as special matters, we glance briefly at our subject in this distribution.

The pleasure-grounds comprise the lawns, the walks or drives, the flower-beds, ornamental trees and shrubbery, and, in large places, terraces, lakes and fountains, statues, rockwork, fernery, and the like.

The kitchen-garden, being designed for the supply of fruit and vegetables, contains the trees, plants, and bushes needful for that purpose, with proper walks for access to them, and appliances, such as hotbeds, pots, and frames, &c., for advancing or improving them; and is often enclosed either partly or wholly by a wall, which shelters and promotes the growth.

(1) The *pleasure-ground* (or flower-garden), however small, has almost always one grass-plot, which is called a lawn, though it may be but a little one. Whether space be scant or ample, the *lawn* is the leading feature and the most pleasant part of the pleasure-ground, and it should be well kept first of all. This can be done at small expense by frequent use of the 'lawn-mower,' which has quite superseded the scythe wherever the slope of the ground permits it. It is, however, of prime importance that the grass should be of the proper kind, and not of rank or wiry growth. Hence the most perfect lawns are made by the sowing of carefully selected seed rather than by laying turf, though the latter is the quicker process. In any case, the use of the roller must not be neglected, and during the time of rapid growth the lawn-mower, set for cutting close, should be employed at least twice a week. But it is a mistake to mow very closely during periods of drought. All weeds should be extirpated as soon as they appear, and moss (which is in damp situations the worst of all foes) must be checked at once, or it will soon destroy the herbage.

The *walks* are even more important in many cases than the lawn or lawns, and unless they have been made with skill and care they will always be troublesome. A dry, compact, and even surface, without which no good walk can be, is not secured without depth of substance, proper form, and good drainage. The depth should be at least 12 inches, to secure freedom from weeds and worm-casts, as well as a firm, dry surface. Nine inches of brick-rubbish, clinkers, chalk, burnt earth, or other open and absorbent matter should underlie 3 inches of good binding gravel, and the middle should be rounded well to carry off the rainfall, for which purpose also there must be drain-traps on either side conducting into cesspools, or other receptacles of ample capacity. The position and frequency of these drain-traps must depend upon the slope of the ground, the average rainfall of the place, &c. It is false economy to stint the width of walk, even when carriages are not required. No walk should be less than 5 feet in width, unless there is some special reason, and 6 or 7 feet should be afforded even to a side-walk of any importance. It is a common practice to scatter salt or other poisonous matter on walks to destroy the weeds or worms, but the remedy is generally worse than the disease. With proper care a walk can be kept clean, and looks more cheerful without these applications.

As to the flower-beds, their arrangement and composition should depend upon the taste of the owner, which is too often set aside in favour of the passing fashion. A common mistake in small gardens is to cut up the grass into intricate patterns with a number of fantastic flower-beds, and to lay them out in colours, like a window of stained glass. Or even the same bed is planted with stripes and sweeps of every tint produced by bloom and foliage, and the stiff artificial effect is called a triumph of carpet-bedding. Happily this taste is growing obsolete, and a more natural style is in vogue again. But the opposite extreme must be avoided, that of having flower-beds without flowers. The borders should have at least two bright periods, that of spring-blooming bulbs and tubers, from March to the middle or end of May, and again that of bedding plants, from the latter part of June till the frost of autumn nips them. In the larger flower-beds there are also some perennial plants or shrubs of dwarf habit, such as roses, azaleas, rhododendrons, and the like, which form the back or centre, according to the slope. Whatever the shape may be, every flower-bed should have sufficient slope of soil and definite edging, whether of turf, or tiles, or box, or other dwarf-growing and tidy plants; and the surface should be dressed at least once a year, if the soil cannot otherwise be renewed, with rich material of neat appearance, such as thoroughly rotten manure, decomposed vegetable substance, &c., the darker in colour the better, but light in substance, and not apt to bind. The plants employed for summer bedding (which should be done towards the end of May) have generally been raised under glass in small pots, and their variety is almost endless, new ones being introduced continually. As a general rule those of prostrate or very low habit should be in front, with taller growth towards the centre or back, and a pleasing contrast or change of colour. Most of them will flower for weeks in succession, if well watered and not allowed to seed—for the formation of seed checks the growth at once.

In large pleasure-grounds ornamental trees add much to the beauty of the scene, by graceful form or tint of foliage, and sometimes by brilliance of bloom or berry. As a general rule these should stand far apart, unless there is something unsightly to conceal, and should not be very near the dwelling-house, except where shelter is needful. The choice and arrangement belong rather to the department of landscape-gardening, but none should be planted which have not been proved capable of enduring the coldest winter or the roughest weather they are likely to confront. This caution applies especially to all the race of imported conifers, few of which can withstand a winter of exceptional rigour. Thus in the second half of the 19th century, in 1860, 1867, and 1881, that general favourite the *Abies*, or *Cedrus Deodara*, has been greatly injured by frost, even in the south of England.

The shrubbery also is a pleasant adjunct wherever space is plentiful, affording the coolest walk in summer, and in winter the most sheltered. The shrubs should be mainly evergreen, though a few deciduous may be admitted for the sake of the bloom or variety of colour. But forest-trees must not be allowed to overhang and starve the dwarfer growth.

Other features, such as terraces, lakes, and fountains, &c., pertain to the domains of the wealthy. See works on landscape gardening by Bloomfield and Thomas, Robinson, Downing, Elliott, or Parsons. But a place without any great pretensions may have its rockwork and fernery,

which are often combined in some sheltered spot, and offer a pleasant retreat from the glare of the flower beds or trimness of the lawn. Many good judges pronounce that statues are out of place even in the largest garden, intruding on the sense of repose, and competing for attention with fairer nature. But, if the owner must have them, he should not post them too conspicuously, and should have them as little as possible at enmity with nature.

(2) The *kitchen-garden*, for the supply of fruit and vegetables, is generally kept out of view from the house, either by walls or a fringe of trees or shrubs. This also should have good walks and drainage; but use is more studied than appearance here, so that graceful curves are dispensed with, and the ground is divided conveniently into squares or parallelograms. When the case permits, this garden is enclosed by walls of stone or brick—the latter to be preferred for fruit—and should slope towards the south or south-east, and must not be overhung by trees. There are very good gardens not favoured thus; but the ideal kitchen-garden perhaps should be a square of from one to two acres, facing not the cardinal but the intermediate points, SE., SW., NW., NE. Every wall thus obtains a share of sunshine, the south-east aspect is quite as good as the south, and the south-west not very far inferior, at least in the warmer part of England, while the north-east aspect is much better than due north for Morello cherries or other hardy fruit. Parallel with the walls inside are borders from 12 to 25 feet in width, parted by straight walks at least 5 feet wide from the squares or parallelograms forming the chief area, which are intersected by paths at right angles, with two main walks crossing at the centre of the garden. Very often these inner squares, or quarters, are cropped with vegetables or bush-fruit, while the wall-borders are reserved for strawberries, early lettuce, kidney-potatoes, or other dwarf growth which is advanced by the warmth of the situation. Although the produce of the kitchen-garden may be roughly distinguished as vegetables and fruit, the two are very seldom kept entirely apart, the general practice being to crop the ground with vegetables between the lines of fruit-trees. And it is still more difficult to part the two by any botanical definition. Popular usage must therefore be followed, though even this is sometimes uncertain, the tomato, for instance, being assigned by some to the fruit and by others to the vegetable class.

In common parlance, vegetables are described as plants grown for culinary use. Of some the esculent part is the root; of others, the stem or foliage; of others, the bloom or its receptacle; of others, the seed, whether ripe or unripe, and with or without its capsule. As an instance of each may be given the carrot, celery, cabbage and cauliflower, peas and beans, of which latter the seed is consumed without the pod or with it, according to the variety. The vegetables chiefly used in Britain are as follows, some attempt being made to place them according to their importance, though all households may not concur in this. The potato, the cabbage-tribe (including the hearted cabbage, the colewort, the savoy, the broccoli, and cauliflower, seakale, couve tronchuda, and others), onions and leeks; salad-plants, such as lettuce, endive, radishes, &c.; the leguminous—i.e. peas and beans, of several varieties; the carrot, celery, turnips and parsnips, asparagus, spinach, rhubarb, beet-root, shallots and chives, artichokes (both Jerusalem and globe), cucumbers and marrows, salsify and scorzonera, horse-radish, and culinary herbs of divers kinds. The tomato or love-apple (*Lycopersicum esculentum*) has of late years become so popular, and is considered so wholesome, that it claims a high place in the foregoing list, which is not presented as exhaustive. For all of these plants a soil of medium staple is desirable, for a stiff clay is cold and too retentive of moisture, while a sandy or gravelly land both suffers from drought and affords little nourishment. The soil which gardeners describe as a rich loam is the best of all for their purposes; and if it be 3 or 4 feet in depth, with a substratum of gravel to ensure drainage, it will grow the very best vegetables, without that excess of manure which is apt to increase the size, but to impair the flavour. Space forbids us to do more than cite a few general rules to be observed in the growth of vegetables, and there are plenty of excellent books on the subject.

A heavy soil is much improved by the mixture of light materials, such as sand, ashes, leaf-mould, road-scrapings, or anything that tends to keep the surface open and the mass more permeable. A poor sandy staple, on the other hand, should be made more retentive and tenacious by the addition of clay or heavy loam or manures of a moist and substantial kind. Whatever the soil be, it should be moved deeply at every time of planting, but the subsoil, if very poor, should not be brought up, especially for shallow-rooted plants. All the cabbage-race, and nearly all plants that are grown for their flower or foliage, require strong nurture and plenty of moisture; while many plants cultivated for the sake of the root, especially the potato, are injured by reeking and heavy manures. Even the onion, though it likes a rich bed, should not have a rank one. Watering, if once begun, should be repeated, until there is sufficient rainfall. The use of the hoe between growing plants is most beneficial, and the surface should be kept loose and open. Let nothing run to seed, unless the seed is wanted. It is better to give too much space than too little, and the sequence of crops should be carefully considered, so that like should never follow like, when it can be avoided. If it cannot be avoided, the ground should be deeply turned over, and plenty of fresh nourishment supplied. In planting, let the fibrous roots be spread well, and the soil made firm round the stem or collar. Whether the crop is sown or planted, the drills or rows should be so arranged that the sunshine may pass along rather than across them, and few plants come to perfection under trees even in the brightest summers.

Fruit, which forms an important part of kitchen-garden produce, is ranged in three classes generally, according to its mode of growth, whether on plant, or bush, or tree. Of plant or ground fruit we have chiefly the strawberry and the melon. The latter is rather a subject for cultivation under glass—although in warm spots and fine summers the hardier sorts may succeed in the open; but the strawberry is to be found in almost every kitchen-garden, a universal favourite, and not difficult of culture if the right kinds be selected. A sunny wall-border deeply dug, and then trodden firm, if the soil be light, is the best position for the early kinds. The distance between the plants is governed by the vigour of the growth, but the rows should generally be two feet apart, or even three, when the growth is very strong. The beds should be renewed every second or third year, according to the constitution of the kind. Probably this fine fruit takes its name, not (as is often supposed) from the use of straw to keep it clean, but from the way in which the berries, having but a slender footstalk, are strewn or strawn by their weight upon the ground.

Of bush-fruit the most important are currants, gooseberries, and raspberries, the former two being raised from cuttings, and the last from suckers. Raspberries delight in a rich and heavy soil, and a place where no drought can reach them. The black

currant also rejoices in moisture; but the white and red currants and gooseberries thrive well in lighter places.

Tree-fruit is of many kinds, and grown in divers manners. A broad distinction was made of old betwixt wall-fruit and that of standards, as if the former were far superior both in size and quality. But now it is acknowledged that any fruit which can be ripened thoroughly or brought into proper state for gathering 'in full wind,' as the French express it, will prove of higher flavour and of finer flesh than if it had received the relaxing influence and coddling of a wall. Still, the wall affords much fairer chance of protecting tender bloom from frost, and heavy fruit from winds, as well as of ripening later kinds, which ought not to be culled till October.

Taking wall-fruit first, we find the following chiefly favoured thus: the peach, the nectarine, and apricot, the finer sorts of plums and gages, cherries, pears, sometimes apples of dessert varieties, and also figs and hardy grapes, which ripen in warm seasons and warm places with good management. For stone-fruit the usual mode of training is to spread the branches against the wall in radiations, like those of a fan, removing the breast-wood while quite young, and laying in the bearing wood on one or both sides of the leading branches, and at proper intervals. Very few gardeners understand the education of a wall-tree; and a peach-tree perfectly trained and equally balanced, yet full of vigour, is one of the fairest and rarest sights. Nothing less than loving labour and great skill can bring this to pass; but for ordinary work and good results these points must be attended to—vermin must be nipped in the bud, gross shoots must be removed or reduced, and redundant fruit taken off right early. These rules apply to the pear as well, when trained against a wall, although that fruit is less oppressed by insects, and the tree is usually trained in the horizontal or rectangular form—that is to say, with side-branches issuing at intervals of about a foot from the main stem or leader. Another mode of training, called the 'cordon system,' is now in vogue with the pear, the plum, cherry, and other wall-fruit. This is not by any means a novelty, but rather a revival; and where the walls are high, and many varieties are needed, it is sometimes employed with good effect, though the difficulty is to repress the longing of the tree for ampler foliage. It is a system of strict repression, and the victim requires frequent care; and even at the best we have a triumph of art over nature, instead of with it.

Without the aid of a wall, fine fruit—quite as handsome in some cases, and often of better quality—can be grown in good situations and average seasons with ordinary skill. Trees planted thus for fruiting 'in full wind' are described as either standards, pyramids, or bushes. The first have a single stem free from branches for several feet above the ground—perhaps 6 feet is the average. There the branching begins, and the growth continues according to early treatment, with either an upright leader or open divergence of coequal shoots. This tall growth is mainly used for orchards now, or in gardens for planting alternately with pyramids or bushes. The pyramid—more correctly perhaps it should be termed the conical tree—is formed by allowing the lower shoots to remain, and even encouraging them (when the habit of the sort requires it) by stopping the leader at intervals, so that we have a young tree furnished with tiers of side-shoots from the base upwards in regular succession, yet still possessing a central upright. In the bush the leader has been removed, if there ever was one—for some varieties branch thus by nature; and then we have a spreading growth without any central occupant, as the nut-trees are usually formed in Kent, and the currant and gooseberry everywhere.

Where space is restricted and growth must be compact, the conical form of tree suits well, and offers most temptation to those who love experiments. But when great bulk of fruit is called for, either the 'pyramid' must be allowed to earn its name by magnitude, or the free and tall standard must have its own way, with coercion administered prudently. Many writers, especially nurserymen, have pleasure in proving that the maximum of fruit is to be achieved with the minimum of tree; but nature works otherwise, and if she be not heeded experience will impress the error. Continual lifting and pinching of trees (alternated as such correction is with doses of rank liquor) act upon their systems as feast and fasting might act upon the gardener. To those who have not studied the precepts (rather than the practice) of recent authorities this will appear a truism.

Without controversy, it is enough to say that in this, as is in most other matters, the middle course is the best and safest. Fruit-trees in the open should be planted at fair distance from one another; pyramids of strong sorts 10 feet asunder, and of weakly kinds not less than 8; standard-trees 15 feet apart, to do justice to themselves and allow it for some years to the humbler growth betwixt them. Many must be checked in their lateral spread until they have filled their forms, not densely, but with equable bearing wood; and none should be allowed to sacrifice their future for the sake of present gain. It should also be borne in mind that stone-fruit, if any is thus grown, does not bear the knife as kindly as the pears and apples do. If the plum and cherry must be brought into the form of bush or cone, it can only be done to good effect by nipping the young growth before midsummer, and by very slight winter-pruning. Any amputation of thick branches produces gumming, and maims the tree. To achieve the pear and apple in small compass and with quick increase dwarfing stocks are much employed, the pear being grafted or budded on the quince, and the apple on the *Paradise* or *doucin*. Many varieties thrive well on these, some for many years, and others for a shorter time, according to their liking; and larger and finer coloured fruit is the early result of the union. Nurserymen by experience know what sorts to offer in this form, and what are less complaisant. The espalier also, which may be termed a multiple form of cordon, is frequently found in kitchen-gardens, though not universal as in days gone by. The tree is trained horizontally on stakes, or wires, in tiers proceeding from the central stem, and for heavy fruit this method doubtless offers more stability; but the disadvantages are many, and in common with the *quenouille* (which is a modification of it) the espalier has yielded place to the less exacting pyramid.

For fruit-trees, as for vegetables, a few well-known but often slighted cautions may be offered. Let sufficient space be given; luxuriant growers may sometimes stand alternate with the feebler; let no tree be planted deeply, nay, if the soil be wet and heavy, plant almost upon the surface, banking up and staking well. Remove the coarser tap-roots if there be enough of fibre; prune but slightly, if at all, until fresh growth has started, and then be not too hard with it. Do not clog with rank manure, but let the ground have been well worked before the tree is planted. Give the needful nurture, when the fruit is taxing the resources of the root, either by mulching with fat manure, or presenting it in liquid form. Let not the tree be overcropped: a hundred puny fruits are

not equal in bulk to a score of fine ones, and far less in quality, yet they exhaust the powers of the parent more than the worthy progeny. Be careful as to the time of culling: even the earliest fruit should not be allowed to get dead ripe on the branch, whereas the winter kinds are often gathered prematurely, especially under the menace of a storm. General pruning should be done in winter, when the trees have filled their spaces, and should be tempered with mercy; but for this directions will be found in our article upon that subject.

Hot-beds in the kitchen-garden are chiefly for promoting and protecting early growth of tender stuff, such as marrows, cucumbers, potatoes, mushrooms, &c. No description, but experience alone and common sense can give the key to the management of this close work. Only it may be said that half the failures which occur are caused by excess of heat, stint of air, and injudicious coddling. See also PLANT HOUSE.

The gardener, whether he has to study beauty or utility—not that these are discordant powers—must endeavour to move along the broad walk of intelligence, despising nothing because it seems new, still less because it is old; and striving to learn from others all he can, and from himself the whole of it. The multiplicity of art for him is multiplied by the infinitude of nature, and before he is out of his rudiments his time comes to be made perfect.

Among the many treatises upon Gardening, general or special, a few may here be mentioned: London's *Encyclopædia of Gardening* (1878); London's *Encyclopædia of Plants* (Wooster's edition); Lindley's *Vegetable Kingdom*; Lindley's *Botanical Register*, Lindley's *British Fruits*; Vilmorin's *Vegetable Garden*, Sweet's *British Flower-garden* (7 vols.); Robinson's *Flower-garden*, Paul's *Rose-garden*, Hibberd's *Rustic Adornments*, Hibberd's *Amateur's Greenhouse*, Hogg's *Fruit Manual* (5th edition); Johnson's *Gardener's Dictionary* (Brooks's edition); Barron's *Vines and Vine-culture*; Thompson's *Gardener's Assistant*; Cassell's *Popular Gardening*; Hemsley's *Hardy Trees and Shrubs*, Smith's *Economic Plants*; Sedding's *Garden-craft, Old and New* (1892); Miss Amherst's *History of Gardening in England* (1896).

Gardes Suisses. See SWISS GUARDS.

Gardiner, a port of Maine, on the Kennebec River, 56 miles NNE. of Portland; pop. 5500.

Gardiner, COLONEL JAMES, son of Captain Patrick Gardiner, was born at Carriden, in Linlithgowshire, January 11, 1688, and when only fourteen years old obtained a commission in a Scots regiment in the Dutch service. In 1702 he passed into the English army, and in 1706 was severely wounded at the battle of Ramillies. Gardiner fought with great distinction in all the other battles of Marlborough. In 1715 he was made first lieutenant, then captain of dragoons; and in the same year he gave a conspicuous proof of his courage, when, along with eleven other daring fellows (eight of whom were killed), he fired the barricades of the Highlanders at Preston. From an early period Gardiner was noted for his licentiousness; but in the year 1719 a vision of Christ on the cross transformed the brave but wicked soldier into a pious and exemplary Christian. In 1724 he was raised to the rank of major, and in 1726 he married Lady Frances Erskine, daughter of the fourth Earl of Buchan, by whom he had thirteen children, only five of whom survived him. In 1730 he became lieutenant-colonel of dragoons, and in 1743 colonel of the Enniskillens. Deserted by his dragoons at the battle of Prestonpans, fought close to his own house, he put himself at the head of a handful of infantry, and fought till, cut down with a Lochaber axe, he was borne to the manse of Tranent, where he died in a few hours, September 21, 1745. See his Life by Dr Doddridge (1747).

Gardiner, SAMUEL RAWSON, historian, was born at Ropley, in Hampshire, March 4, 1829, and educated at Winchester and at Christ Church, Oxford, taking a first class in 1851. For some years he filled the chair of Modern History at King's College, London, but resigned it in 1885 to continue his History at Oxford on an All Souls' elective fellowship. In 1882 he was granted a Civil List pension of £150. The work to which he has devoted himself with more than German thoroughness and unbiased openness of mind began with the following instalments: *The History of England from the Accession of James I. to the Disgrace of Chief-justice Coke* (1863), *Prince Charles and the Spanish Marriage* (1869), *England under the Duke of Buckingham and Charles I.* (1875), *The Personal Government of Charles I.* (1877), and *The Fall of the Monarchy of Charles I.* (2 vols. i. and ii. 1882). The last was of course intended to extend to the death of the king, but in the first two volumes had only been brought down to 1642, when the whole of the preceding were grouped together and republished (1883–84) in ten volumes, as a continuous history of England from 1603 to 1642. The *History of the Civil War* (3 vols. 1886–91) was continued by *The History of the Commonwealth and Protectorate* (vols. i. and ii. 1894–97). Shorter books deal with the character of Cromwell (1897) and with the Gunpowder Plot (1897, in reply to Father Gerard's attempt to prove that there was no real plot). *The Student's History of England* (3 vols.) appeared 1890–92. Other works are *The Thirty Years' War* (1874) and *The Puritan Revolution* ('Epochs' series, 1875), and an *Introduction to the Study of English History* (1881; new ed. 1894), written with Mr J. Bass Mullinger. For the Camden Society he edited the *Fortescue Papers*, the *Hamilton Papers*, the *Parliamentary Debates in 1610*, and *Debates in the House of Commons in 1625*.

Gardiner, STEPHEN, Bishop of Winchester, was born between 1483 and 1490 at Bury St Edmunds—a clothworker's son, say some; others, a natural son of Bishop Woodville of Salisbury. He studied at Trinity Hall, Cambridge, in 1520–21 proceeding doctor of civil and of canon law; and soon after, through the patronage of the Duke of Norfolk, he was introduced to Wolsey, who made him his secretary. In this capacity he won the confidence of Henry VIII., and by him was employed during 1527–33 in promoting at Rome and elsewhere his divorce from Catharine of Aragon. At this time he was known as Dr Stephens. He had become master of his old college in 1525, Archdeacon of Norfolk in 1529, and two years later of Leicester, when in November 1531 he was consecrated Bishop of Winchester. Good Catholic though he was, he supported the royal supremacy, and wrote a treatise in defence of it, *De verâ Obedientiâ* (1535). Still, he opposed all measures tending to a doctrinal reformation, he had a principal hand in the downfall of Thomas Cromwell, and the 'Six Articles' were largely of his framing, though the story that he lost Henry's favour by an attempt to impeach Catharine Parr of heresy is not based upon contemporary authority. On Edward VI.'s accession (1547), for refusing to comply with the new teaching he was committed to the Fleet prison, but released three weeks afterwards, to be next year again seized and lodged in the Tower, and in 1552 deprived of his bishopric. When in 1553 Mary ascended the throne, he was set at liberty, restored to his see, and appointed Lord High Chancellor of England. He now took the lead in the persecution of the Protestants, and has been charged with the grossest cruelty. Dr Maitland shows, however, that in very many instances the parties brought before his court were arraigned for treason rather than heresy; and certain it is that

he helped Peter Martyr to leave England, and interposed to protect Roger Ascham. He died very wealthy at Whitehall, of the gout, on 12th November 1555, and was buried in his cathedral. On his deathbed he cried out in Latin, 'I have denied with Peter, I have gone out with Peter; but I have not wept with Peter'—referring doubtless to his temporary renunciation of the papal supremacy. We have a dozen Latin and English treatises from his pen; but the *Necessary Doctrine and Erudition of a Christian Man* (1543) was probably Henry's own, not a joint production of Gardiner and Cranmer. Gardiner's character has been the subject of much debate; but it can scarcely be doubted that he was a zealous, though not a spiritually-minded, churchman. His devotion was that of an out-and-out partisan; but it was none the less real, for he would have laid down his life for the cause which commanded his sympathies. See Bass Mullinger in the *Dict. Nat. Biog.*; and Dixon's *Hist. of the Ch. of England* (vol. iv. 1891).

Gardner, a post-village of Massachusetts, 70 miles WNW. of Boston by rail, with manufactures of wooden wares—chairs, pails, tubs, and toys. Pop. (with South Gardner) 8283.

Garfield, James Abram, twentieth president of the United States, was born in Orange, Ohio, 19th November 1831. His father, who was descended from one of the Puritan founders of Watertown, Massachusetts (1630), died soon after the boy's birth, leaving his wife, the daughter of a Huguenot family that had settled in New England in 1685, to bring up unaided her four small children, battling bravely with poverty and privation in her lonely cabin in the 'Wilderness' (now the 'Western Reserve') of Ohio. At the age of ten young Garfield already added something to his mother's income by work on the neighbouring farms; in winter he made steady progress in the district school. In 1849 he entered Geauga Seminary, at Chester, Ohio; and in the summer months he turned to any and all kinds of work, to provide funds for the ensuing winter. At this period Garfield joined the Campbellite body. He next passed on to the college at Hiram, Ohio, supporting himself meanwhile by tuition, and finally graduated at Williams College, Massachusetts, in 1856. Returning to Hiram, he became its president in 1857, at the same time preaching and studying law. He was elected to the state senate in 1859, and on the outbreak of the war received the command of the 42d regiment of Ohio volunteers. In December 1861 he was given a brigade, with orders to drive the Confederates out of eastern Kentucky, and with reinforcements gained the battle of Middle Creek, 10th January 1862, from which his commission as brigadier-general was dated. He had been promoted major-general for gallantry at Chickamauga, September 19, 1863, when he resigned his command to enter congress, at the age of thirty-two. He sat in congress, rendering valuable assistance in military and financial questions, until 1880, and acted latterly as leader of the Republican party in the house. In January 1880 he was elected a United States senator, and in June of the same year he was adopted as presidential candidate by the Republican convention at Chicago. Garfield's nomination came as a surprise to his party, and was simply the result of a compromise between the supporters of Grant and Blaine, after thirty-three ineffectual ballots had proved that neither could secure the prize. He proved, nevertheless, a strong candidate, regardless of precedent delivered speeches in his own behalf, and finally defeated General Hancock by a narrow majority on the popular vote, but by 215 to 155 electoral votes. He was inaugurated on 4th March 1881, and identified himself with the cause of civil service reform, whereby he irritated a powerful section of his own party (see Conkling). On the morning of 2d July, as he was setting off to witness the closing exercises of his old college, he was shot down from behind by a disappointed office-seeker, Charles Guiteau. For weeks he lingered between life and death; early in September he was removed to Long Branch, New Jersey, and there he died, at Elberon, 19th September 1881. He was buried at Cleveland (q.v.). The vice-president, General Arthur (q.v.), succeeded him. Garfield held power long enough to show himself worthy of it. His tragic death has given him prominence in the roll of American presidents, but it was his brave and patient endurance of suffering that endeared him most to his countrymen and claimed the sympathy and admiration of the rest of the world. His speeches were collected in 2 vols. (Boston, 1882). See the Life by J. R. Gilmore (1880).

Garefowl. See Auk.

Gare Loch. See Dumbartonshire.

Gar-fish. See Gar-pike.

Garganey. See Teal.

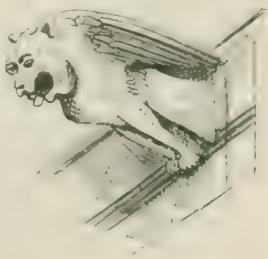
Gargano (ancient *Garganus*), a mountainous peninsula, the 'spur' of Italy, in the province of Foggia, jutting out some 30 miles into the Adriatic Sea, and attaining in Monte Calvo a height of 5110 feet. Bee-keeping is yet as generally engaged in as in the time of Horace. The district is visited mainly by pilgrims to a shrine of St Michael on Monte St Angelo.

Gargantua. See Rabelais.

Gargarus. See Ida.

Gargle, or Gargarism, a class of medicines intended to be churned about in the throat, with a view of cleansing the parts, and of acting as antiseptics, Astringents (q.v.), sedatives, or Stimulants (q.v.), in various conditions of the throat. In using them a full breath is taken, the mouth filled with the liquid, and the head thrown back; as the breath is gradually allowed to escape, the liquid is freely brought into contact with the upper part of the throat. They are not generally suitable in cases of acute inflammation of the throat, but often valuable in chronic affections. Among the most useful gargles are—Antiseptic: Condy's fluid, 10 to 20 drops; carbolic acid, 4 to 8 grains. Astringent: tannic acid, 10 grains; alum, 20 grains. Sedative: bromide of potash, 20 grains. Stimulant: vinegar, 30 drops; dilute hydrochloric acid, 20 drops, dissolved or diluted with a wineglassful of water.

Gargoyle, a projecting spout, leading the water from the roof-gutters of buildings. Gargoyles of various forms have been used in almost all styles of architecture, but were peculiarly developed in connection with Gothic architecture. Some gargoyles are small and plain, others large and ornamental, according to their various positions. They are carved into all conceivable forms—angelic, human, and of the lower animals; and, as in fountains, the water is generally spouted through the mouth. In late castellated buildings, they frequently assume the form of small cannons projecting from the parapet. Gargoyles are generally carved in stone, but are



St Stephen's, Vienna.

sometimes executed in wood, and are made of great length so as to throw the water into the gutter formed in the middle of the streets of some

St Alkmund's Church, Derby; 1400.

Horsley Church, Derbyshire, 1439.

old towns. In modern times the use of leaden pipes to convey away the water from roofs has almost entirely superseded the use of gargoyles.

Garhmukhtesar, an ancient town in the North-west Provinces of India, on the Ganges, 26 miles SE. of Meerut, with four shrines dedicated to Ganga, and a great fair, which attracts 200,000 pilgrims. Pop. 6100.

Garhwal, a native state in the North-west Provinces of India, on the borders of Tibet: area, about 4180 sq. m.; pop. 241,242. Also the name of a British district in the North west Provinces, next to independent Garhwal: area, 5630 sq. m.; pop. (1891) 407,818. Being on the southern slope of the Himalayas, Garhwal is for the most part a mass of rugged mountain-ranges, whose elevation above the sea reaches in Nanda Devi 25,661 feet. The native state is the cradle of both the Jumna and the Ganges, and in the district are the Alaknanda and its point of junction with the Bhagirathi (see GANGES); consequently, in spite of the length and ruggedness of the way, crowds of pilgrims are attracted to the peculiarly sacred localities of Deoprayag and Gangotri.

Garibaldi, GIUSEPPE, the Italian patriot, was born at Nice on the 4th July 1807. His father was a simple, God-fearing fisherman, seldom in prosperous circumstances, but he contrived nevertheless to give the boy a tolerable education, possibly with the object of making him a priest. Giuseppe, however, was determined upon becoming a sailor, and rising rapidly in the merchant-service, he was appointed in 1828 second in command of the brig *Cortese*. His early voyages, which included a visit to Rome, filled him with democratic ardour, whence it is only natural that in 1834 he should have been involved in the 'Young Italy' movement of Mazzini, whom he met at Marseilles, and should have been condemned to death for taking part in an attempt to seize Genoa. He had volunteered for the royal navy with the object of gaining recruits for the cause. Garibaldi escaped to Marseilles and afterwards to South America, where he offered his services to the province of Rio Grande, which was in rebellion against the Emperor of Brazil. He distinguished himself as a guerilla warrior and privateer, was taken prisoner and suspended for two hours by the wrists for attempting to escape, and eloped with and soon married the beautiful creole Anita Riveira de Silva, the companion of his earlier campaigns and the mother of his children Menotti, Ricciotti, and Teresa. After some mingled experiences as drover, shipbroker, and teacher of mathematics, he offered in 1842 his assistance to the Montevideans, who were at war with Rosas, the tyrant of Buenos Ayres. In this struggle Garibaldi won fresh renown, by water as naval commander in a two days' engagement, and on land as organiser and commander of the Italian legion, especially on 8th February and 20th May 1846, when he beat off considerably superior forces of the enemy at Salto San Antonio and the Dayman River. He gives a full account of his various exploits in his autobiography.

The 'red shirt' of Garibaldi had thus already become famous, when in 1847 the reforming pope, Pius IX., ascended the throne of St Peter. Garibaldi, the Montevidean struggle being practically at an end, promptly offered to enlist under his banner, but received an ambiguous reply: and Charles Albert of Sardinia, whom on his arrival in Italy in June 1848 he found besieging the Austrians in Mantua, coldly referred him to his ministers. Garibaldi, however, after the collapse of the Sardinian army, at the head of a body of volunteers performed some notable feats against the Austrians on the Swiss frontier, and then wandered about Italy until he reached Ravenna. In 1849 he threw in his lot with the revolutionary government of Rome against Pius IX., who had retracted his liberal concessions and fled the city. Garibaldi, indeed, voted for the proclamation of the republic in February, drove the French expeditionary force under Oudinot from the Porta San Pancrazio in April, and routed the Neapolitans at Palestrina and Velletri in May, sending them pell-mell over the frontier. Meantime, however, Mazzini had been inveigled by Oudinot into an armistice; and, being abundantly reinforced, the French proceeded to lay siege to Rome. Garibaldi was recalled, much to his disgust. He had refused the dictatorship on June 2, and on July 3, after a brilliant defence, he was forced to abandon his post. He retreated, pursued by the Austrians, to the Adriatic, where poor Anita, worn out by suffering and anxiety, died, and was buried in the sand. Garibaldi was at length arrested by the orders of the Sardinian government at Chiavari, and requested to leave Italy, much to the indignation of the people. He betook himself to Staten Island, New York, where he worked for eighteen months as a candlemaker, then became captain of various merchantmen, paying a visit to Newcastle, where he declined a popular demonstration.

He returned to Italy in 1854, and had settled down as a farmer on the island of Caprera, when in 1859 the outbreak of the war of Italian liberation called him to arms once more. He was summoned to Turin by Cavour in February, and at once placed his sword at the disposal of Victor Emmanuel. Though frequently thwarted by the Sardinian generals, Garibaldi and his 'chasseurs of the Alps' rendered valuable service to the allies, especially at Varese in the Valtelline (May 25). After the peace of Villafranca, Garibaldi, with the permission of Victor Emmanuel, went into central Italy as second in command, and helped to consummate the annexation of the territories to Sardinia, but was not allowed as he desired to march on Rome. He was cut to the quick when his native Nice was handed over to France, and declaimed against Cavour in the chamber at Turin. Meanwhile the Mazzinists had been busily conspiring against the effete Bourbon tyranny in the Two Sicilies, and Garibaldi, in spite of Cavour's efforts to prevent him, prepared to come to the rescue. The enterprise appeared dangerous in the extreme; but, as the English cabinet insisted on the neutrality of France, the Bourbons could look for no foreign assistance, and 'the thousand heroes' on landing at Marsala on May 11 met but a feeble enemy. With the exception of the garrison of Milazzo, which capitulated after a battle on July 24, the disaffected troops of Francis II. fought half-heartedly enough, and within three months Sicily was free. Promptly crossing the straits (August 29) Garibaldi began his military

promenade through Naples, and entered the capital (September 7) amid the cheers of King Francis' troops. After a last stand on the Volturno on October 1, the Bourbons took refuge in the citadel of Gaeta. Then Victor Emmanuel, having been elected sovereign of the Two Sicilies by a plebiscite, arrived at Naples, and Garibaldi, refusing all reward, resigned his dictatorship and retired to Caprera. His conduct entailed a quarrel with the Republican party, and he was besides disgusted by the refusal of the Italian ministry to enrol his veterans in the regular army, and at not being allowed to march on Rome and destroy the hated papal government. In this he saw the hand of Cavour, but later publications show that he was mistaken as far as the volunteers were concerned.

During the ensuing years Rome was the centre of his thoughts, though shared with schemes for stirring up rebellion in Hungary, and so causing the Austrians to withdraw from Venice, and in 1862 he embarked on a rash expedition against the capital. If the king and the weak Rattazzi cabinet did not actually egg him on, as Garibaldi said they did, they at all events sat still and allowed him to compromise himself, and then sent troops against him, by whom Garibaldi was taken prisoner at Aspromonte after he had given orders to his troops not to fire (August 28). Badly wounded in the foot, Garibaldi was detained for two months as prisoner at Spezzia, and was then allowed to return to Caprera. He next paid a visit to England to induce the government to espouse the cause of Denmark, and was received with the wildest enthusiasm; but failing to effect the object of his journey, he returned abruptly home at the request of the cabinet. In the war of 1866 he once more commanded the 'Red Shirts' in the Tyrol, but, though his sons Menotti and Ricciotti proved worthy of their father, the campaign as a whole was not marked by very brilliant affairs. Garibaldi accused the government of neglecting to forward men and arms, and their conduct seems to have been marked by unworthy suspicions. Venice was now ceded to Italy, but Rome still remained unredeemed, and, untaught by his previous adventures, Garibaldi in the following year made his last attempt on the Holy City. Arrested on September 22 by the Italian government—whose hands were tied by the convention with France of 1864—he escaped from Caprera in a boat, and placing himself at the head of the volunteers, defeated the papal troops on October 25 at Monterotondo. On November 3, however, the Zouaves, reinforced by a body of French armed with the deadly chassepot, utterly routed him at Mentana. Once more he was allowed to retire to Caprera, whence in 1870 he sent for publication two novels, entitled *Cantoni il voluntario* and *Clelia, ovvero il Governo del Monaco*. The latter has been translated into English under the title of the 'Rule of the Monk,' but it must be confessed that Garibaldi did not shine as an author, and that the average schoolboy could write as well. In 1872, however, he published a third romance, *Il Mille*, based on the events of the Sicilian expedition. In 1870, though at first a sympathiser with Germany, owing to his hatred of Napoleon III., he resolved to come to the assistance of the French Republic. Gambetta did not receive him with much enthusiasm, but eventually placed him in command of the volunteers of the Vosges. Badly crippled by rheumatism, however, and hopelessly outnumbered, he confined his movements to the neighbourhood of Dijon and Autun. Even so his troops distinguished themselves, especially on 20th January 1871, when Ricciotti beat off a body of Prussian Pomeranians near Dijon. The Prussian general, Manteuffel, has left a favourable estimate of his tactics during the campaign. Garibaldi was elected to the Assembly at Bordeaux by Dijon, Nice, and Paris, but, as a foreigner, was not allowed to address the deputies.

During the remainder of his life he remained a helpless invalid at Caprera, except on occasions like that in 1874, when he took his seat in the Chamber of Deputies at Rome; and through the generosity of his English friends he became entire proprietor of the island. In 1880 the marriage into which he had been entrapped by an adventuress as far back as 1859 was annulled, and he was promptly united to Francesca, his peasant-companion, who had originally come to the island as nurse to the children of his daughter Teresa, the wife of Stefano Canzio, one of his officers. During the last years of his life manifestoes poured from his pen, in which professions of devotion to the Sardinian dynasty alternated with the wildest republicanism; and his simplicity, like that of Victor Hugo, was easily persuaded to endorse any document containing the commonplaces of cosmopolitanism. But he was ever constant to the ideal of his youth, the unity of the Italian-speaking race. Thence came his participation in the 'Irridentist' agitation; thence too his undying hatred of the papacy. More practical was his advocacy of the creation of a mercantile navy and the reorganisation of the army, and his interest in the drainage of the Campagna and the diversion of the Tiber; but the last project had no adequate result. His religious views latterly embraced a somewhat elementary pantheism: 'God did not make man,' he wrote, 'but man made God,' and death he looked upon as a transmutation of matter. On 2d June 1882 he died, and was sincerely mourned, not only by his fellow-countrymen, but by the lovers of liberty throughout Europe. For though as a soldier he was perhaps nothing more than a good commander of irregulars, and though his ignorance of political considerations sometimes did actual harm to the cause he advocated, yet it would be impossible to overrate the importance to Italian unity of his whole-souled devotion to his country, a devotion which he communicated to all with whom he came in contact. He will always remain the central figure in the story of Italian independence.

Garibaldi's autobiography was published in 1887, and an English translation with a supplementary biography by Mme. Mario in 1889. The best general sketches of Garibaldi are to be found in J. T. Bent's *Life of Garibaldi*, and in Mme. Mario's *Garibaldi e i suoi Tempi* (Milan, 1884). Elpis Melena's *Garibaldi* (2 vols. Hanover, 1884) is also incidentally instructive. Garibaldi's speeches were published in 1882, and his letters, edited by E. E. Ximenes, in 1885.

Gariep. See ORANGE RIVER.

Garigliano (ancient *Liris*; in its upper course now called Liri), a river of southern Italy, rises in the Abruzzi, west of the former Lake of Fucino, and flows, after a generally southerly course of 90 miles, into the Gulf of Gaeta. It is navigable below Pontecorvo, and abounds with fish. On its banks in 1503 was fought a famous battle between the French and the Spaniards, commanded by Gonsalvo de Cordova, in which the former were totally routed, though Bayard is said single-handed to have held the bridge against 200 Spaniards.

Garlic (*Allium sativum*, see ALLIUM), an herb cultivated from the earliest ages on account of its wholesome and characteristically flavoured bulbs. These break readily up into a dozen or more 'cloves' or subordinate bulbs, which are the developed axillary buds of the exhausted scale-leaves of the parent bulb; and this circumstance is of much service, alike in cultivation and in regulating

the quantity used in cooking. This varies greatly with national taste, from a maximum in Spain to a minimum in Britain. The plant seems to have been introduced along the Mediterranean from the East in very early times, its original home being perhaps the Kirghiz steppes: it is recorded as part of the rations of the Egyptian pyramid-builders, and there perhaps the Jews acquired their fondness for it. It was, however, forbidden to the priests of Isis. The Roman soldiers were given garlic as an excitant (whence the peace-loving maxim, *allium ne comedas*); and the same regimen was applied in the still recent days of cock-fighting. It had also many medicinal applications. Many of the species of Allium are popularly called garlic, with some distinctive addition. *A. oleraceum* is sometimes called Wild Garlic in England, and its young and tender leaves are used as a pot-herb.

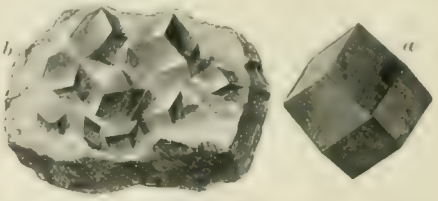
Common Garlic (*Allium sativum*).

Garlic, OIL OF. When the leaves, seeds, or bulbs of garlic and other allied plants are distilled with steam, about 0·2 per cent. of a brown oil, with acrid taste and strong disagreeable odour, passes over. By purification it is obtained as a pale yellow oil having the odour of garlic, and it is then found to consist of the sulphide of allyl, $(C_3H_5)_2S$. This oil is nearly related to the pungent oil of mustard, C_3H_5NCS, an isomer of the sulphocyanide of allyl, and is of much interest chemically, but it is of no importance from an industrial or popular point of view.

Garnet, HENRY, is chiefly remembered for his connection with the Gunpowder Plot. He was born in 1555, and educated as a Protestant at Winchester College. A few years after leaving school he became a Roman Catholic, went abroad, and entered the Society of Jesus. He acquired among the Jesuits a considerable reputation for learning and piety. In 1586 he was sent upon the English mission, where for eighteen years he acted as provincial of the Jesuits. The indiscreet zeal with which he promoted certain Jesuit schemes for the advancement of their order brought him into odium with an influential section of the secular clergy; while his friendship and correspondence with the extreme partisans of the Spanish faction brought him under suspicion of treason. In the spring of 1605 he wrote to a Jesuit in Flanders in commendation of Guy Fawkes, when that conspirator went over to the Netherlands in order to solicit the co-operation of Sir William Stanley and others in the plot of that year. Garnet admitted that before this he had come to know, in a general way, of the projected treason, and that in July he heard the particulars, under the seal of confession (so he said), from another Jesuit, Greenway. At the time of the discovery of the plot he was present at the place of meeting appointed by the conspirators, and shortly afterwards was apprehended on suspicion at Hindlip. The chief grounds for inferring his complicity in the plot were derived from a secret conversation held by him in prison with a brother Jesuit, Oldcorn, overheard by spies set for the purpose by the government.

That Garnet knew the particulars of the murderous design months before its attempted execution was proved and admitted. That this knowledge was derived exclusively from the confessional rests upon his statement only. It would probably have gone less hard with the prisoner had not his judges been prejudiced against him, not indeed so much on account of his creed as for his extraordinary practice of equivocation when on his trial. He was condemned for misprision of treason, and executed May 3, 1606. In proof of his innocence the story of a miraculous straw, touched by his blood, and bearing a miniature portrait of the Jesuit, was circulated among Roman Catholics; and it is said that the mere sight of the straw made five hundred converts to his creed. Garnet was considered by his co-religionists generally as a martyr for the seal of confession, and as such was proposed, with the rest of the victims of the penal laws, for the honour of beatification; but it is remarkable that, while more than three hundred candidates obtained the title of Blessed or Venerable, the objections of the 'devil's advocate' in the case of Father Garnet were so cogent that the pope was induced to defer the introduction of his cause. See GUNPOWDER PLOT, and works cited there.

Garnets, a group of minerals that crystallise in the cubical system. Their commonest form is the rhombic dodecahedron, or a combination of this with the icositetrahedron. Their composition may be represented by the general formula, $M_3R_2Si_3O_{12}$, where M = Ca, Fe, Mg, Mn; $R_2 = Al_2$, Fe_2, Cr_2. Thus we have lime-alumina, iron-alumina, magnesia-alumina, manganese-alumina, lime-iron, and lime-chrome garnets. Garnets have a hardness ranging



Garnet:
a, a detached crystal; *b*, portion of rock with embedded crystals.

from about 7 to 8. Their lustre is vitreous and resinous, and they are rarely transparent and very seldom colourless. The most common colour is some shade of red, but brown, yellow, green, and even black varieties are known. Some of the better known kinds are as follows:

Lime-alumina Garnets.—*Grossular* (*grossula*, 'a gooseberry'), so called from its green colour—the tint is usually rather pale—found in Siberia and in Norway; *Essonite* or *Cinnamon-stone* (q.v.); *Succinite*, amber-coloured, from Ala, Piedmont; *Romanzovite*, brown or brownish-black, from Kimito, in Finland.

Iron-alumina Garnets.—*Almandine*, the *precious* or *oriental* garnet of jewellers; red, transparent; occurs as a rock-constituent in many crystalline schists and granites, and occasionally also in trachyte, and is met with in the sands and alluvial soils which have resulted from the disintegration of such rocks, as in Ceylon, Pegu, Hindustan, Brazil, Greenland, Scotland, &c. Iron-alumina garnets are often crowded with enclosures, have a somewhat dull lustre, and are full of flaws; such are usually known as *common garnet*. Common garnet often occurs massive, and not infrequently

forms a very considerable part of certain kinds of rock, as garnet-rock, eklogite, and granulite.

Magnesia-alumina Garnets.—These are somewhat uncommon—the best known being the black garnets from Arendal in Norway. Another is *Pyrope*, which is transparent and of a blood-red colour. *Carbuncle* (q.v.) is the name given by lapidaries to a pyrope cut *en cabochon* or 'tallow-drop.' It occurs in serpentine and in the loose soils derived from the breaking-up of that rock, as in Bohemia, where it is used as a gem. It does not occur in crystals, but in rounded or angular grains.

Manganese-alumina Garnets are met with, chiefly in small grains and crystals in schists and granites, near Aschaffenburg, in Spessart (Franconia); in the Ardennes, Piedmont, Connecticut, &c. The Franconian locality has given its name to this garnet—*Spessartine*, which is of a deep hyacinth or brownish-red. Many of the garnets which occur in the granites of Scotland are rich in magnesia, but from the abundance of ferric oxide which they contain they are included under the iron-alumina group.

Lime-iron Garnets.—Of these the most important is *Melanite*, velvet-black and opaque; it occurs as a rock-constituent in various volcanic rocks (phonolite, leucite-lava, and tuff), as at Frascati (Albano Mountains, near Rome), Laacher See, near the Rhine, Oberbergen (Kaiserstuhl), &c. Other varieties are *Topazolite*, yellow, green, and greenish-yellow; *Aplome*, green, brownish, and sometimes yellow.

Lime-chrome Garnets.—*Uwarowite*, an emerald-green garnet, translucent at the edges, found in the Urals.

The garnets of commerce are brought from Bohemia, Ceylon, Pegu, and Brazil; the most esteemed kinds (coming originally from Syriam, in Pegu) are vulgarly called *Syrian* garnets. They are violet-purple; and now and again very fine specimens almost vie in colour with the oriental amethyst. The stones vary in size from the smallest that can be worked to the size of a hazel-nut. Larger ones are common enough, but these are rarely free from flaws or impurities.

Garnett, RICHARD, philologist, was born at Otley, in Yorkshire, in 1789. He had already tried commerce and the church, when in 1838 he found his work in the appointment of assistant-keeper of printed books at the British Museum. He died in 1850. One of the founders of the Philological Society, he contributed many striking papers (on Celtic subjects, largely) to its *Proceedings* and to the *Quarterly Review*. These were collected by his son in *Philological Essays* (1859).—RICHARD, his son, was born at Lichfield, February 27, 1835, and appointed in 1851 assistant in the printed book department of the British Museum, where also he became superintendent of the reading-room in 1875. This office he resigned in 1884 to devote himself to the printing of the Museum Catalogue; in 1896 he became Keeper of the Printed Books. LL.D. of Edinburgh since 1883, he has published several volumes of verse; *Relics of Shelley* (1862), *Selections of Shelley's Poems* (1880) and *Letters* (1882); *De Quincey's English Opium Eater* (1885); a sensible little book on Carlyle (1883); a volume of humorous and satirical prose tales, *The Twilight of the Gods* (1888); and a book on the literature of *The Age of Dryden* (1895). The article on Milton in the present work is from his pen. He retired in 1899, and is C. B.

Garnier, FRANCIS, sailor and traveller, was born at St Etienne, 25th July 1839, and entering the navy fought in the Chinese war (1860–62). Appointed to a post in French Cochin-China, he promoted a great exploring expedition, of which he ultimately assumed the command. Starting from the coast of Cambodia (q.v.), the expedition travelled to Shanghai by way of Yunnan. He took part in the defence of Paris in 1870–71, and subsequently travelled again in China. In the Tonkin war he took Hanoi, but was killed, 2d December 1873. His chief work is *Voyage d'Exploration en Indo-Chine* (2 vols. 1873). See Petit's *Francis Garnier* (Paris, 1885).

Garnier, ROBERT (1534–90), a French tragedian, the most distinguished of the predecessors of Corneille (see DRAMA). Editions of his plays have appeared at Paris (1607), Rouen (1618), and Heilbronn (1883).

Garnier-Pages, ETIENNE JOSEPH LOUIS, was born at Marseilles, 27th December 1801, and practised there as an advocate, but at Paris in 1830 took a conspicuous part in the July revolution, and in 1831 became a prominent member of the Chamber. He died 23d June 1841.—His half-brother, LOUIS ANTOINE, born 16th July 1803, also shared in the July revolution, and succeeded his brother in the Chamber, leading the extreme Left. He became in 1848 mayor of Paris and finance-minister of the provisional government; was a republican member of the Corps Legislatif in 1864; and was a member of the provisional government of 1871. He died in Paris, 31st October 1878. He wrote the *Histoire de la Revolution de 1848* (1861–62), and *L'Opposition et l'Empire* (1872).

Garnishee. In English law, to garnish (Fr. *garnir*) is to warn, and the garnishee is a person warned not to pay money which he owes to another, because the latter is indebted to the *garnisher* who gives the warning. See ATTACHMENT.

Garofalo, the name by which the painter Benvenuto Tisi or Tisio is known. He spent most of his life (1481–1559) in Ferrara, where he was born; but spent three years in Rome in association with Raphael, on whom he modelled his style.

Garo Hills, a mountainous district forming the south-west corner of Assam, with an area of 3270 sq. m., and a pop. (1891) of 121,570. In the Tura range (4950 ft.) the rainfall is 126 inches.

Garonne (anc. *Garumna*), the principal river in the south-west of France, rises within the Spanish frontier in the Val d'Aran, at the base of Mount Maladetta, in the Pyrenees, 6142 feet above sea-level. About 26 miles from its source it enters the French territory in the department of Haute Garonne, flows in a general north-east course to Toulouse, then bends to the north-west, and continues to flow in that direction until, joined by the Dordogne, about 20 miles below Bordeaux, and widening afterwards into the estuary which bears the name of the Gironde, it enters the Atlantic at the Pointe de Grave. The estuary, the largest in France, is nearly 50 miles long. The total length of the river is about 346 miles; it drains an area of some 22,020 sq. m. Its navigation, which, however, is much impeded above Toulouse, commences for small craft at Cazères; ocean steamers go up to Bordeaux. Its principal affluents are the Tarn, Lot, and Dordogne, on the right; and on the left, the Save, Gers, and Baise. At Toulouse it is joined by the Canal du Midi, which, running eastward to the Mediterranean, forms with the Garonne a means of communication between that sea and the Atlantic; and the river's own *canal latéral*, starting also from Toulouse, runs along the right bank, receives the Montauban Canal, and spans several streams in its course, crossing the Garonne itself at Agen by a magnificent viaduct, and returning to the river at Castets, after a total length of 120 miles. The valley of the Garonne is noted for the beauty of its scenery, but is liable to destructive inundations, the most memorable being that of

1875, when damage to the amount of 85 million francs was caused.

Garonne, HAUTE, a department in the south of France, embracing portions of ancient Gascony and Languedoc, has an area of 2428 sq. m., and a pop. (1872) of 479,362; (1891) 472,383. It is watered throughout by the Garonne, from which it derives its name, and within the basin of which it wholly lies. Occupied in the south by a branch of the Pyrenean range, the slope of the department and the course of its streams are toward the north and north-east. Apart from this southern mountainous region, the department is hilly and fertile. The soil in the valleys is remarkably productive, and bears heavy crops of wheat, maize, flax, hemp, potatoes, and rape-seed. Orchard fruits and chestnuts are produced in abundance, and the annual yield of wine is about 20,000,000 gallons, two-thirds of which is exported. Mineral springs and baths are very plentiful. The chief manufactures are woollen and cotton fabrics, paper, and hardware. The department is divided into the four arrondissements of Toulouse, Muret, St Gaudens, and Villefranche, with Toulouse as capital.

Garotte. See GARROTTE.

Gar-pike (*Belone*), a genus of bony fishes in the family Scombresocidæ, not far from the true pikes (Esocidæ). They have long bodies, and both jaws are prolonged into a slender beak, beset with roughnesses and widely set teeth. They swim actively, with an undulating motion, near the surface, and catch small fishes in their jaws. The common Gar-pike (*B. vulgaris* or *B. belone*) is frequent off British coasts, and is sometimes called Greenbone, from the colour of the bones (especially after cooking), Gorebill, from its characteristic beak, or Mackerel-guide, because it visits

Gar-pike (*Belone vulgaris*).

the coasts just before the mackerel. It is usually about two feet in length, is often brought to the London market, and forms a wholesome dish, in flavour somewhat like mackerel. About fifty species are known from tropical and temperate seas, some twice as long as the British species. The young forms have at first jaws of a normal size, and in growth the lower outstrips the upper. The name Gar-pike is sometimes applied to the far-removed Ganoid, Lepidosteus, or Bony Pike (q.v.).

Garrett, ELIZABETH. See ANDERSON.

Garrick, DAVID, actor, manager, and dramatist, was born on 20th February 1717, at Hereford, where his father, Captain Peter Garrick, was then stationed. Lichfield, however, was the home of the Garricks, and it was in the grammar-school there that David received the chief part of his education, for he must have been in his nineteenth or twentieth year before he was sent to study Latin and Greek under Samuel Johnson, at Edial near Lichfield. His tuition by Johnson lasted for only a few months, and its well-known result was the setting out of master and pupil together, on the morning of 2d March 1737, to journey to London; Garrick to study 'mathematics, and philosophy, and humane learning,' with a view to the bar; Johnson 'to try his fate with a tragedy, and to see to get himself employed in some translation, either from the Latin or the French.' But circumstances brought Garrick's legal studies to nothing, and in 1738 he became a wine-merchant, in partnership with his eldest brother, Peter. Samuel Foote in after years used to say that 'he remembered Garrick living in Durham Yard, with three quarts of vinegar in the cellar, calling himself a wine-merchant.' Garrick, there is no doubt, already had the stage fever, and his attention was probably more taken up with plays and players than with business, so it is not surprising that in 1740 the partnership was dissolved. Garrick then devoted his mind to preparing himself for his intended profession, and in the summer of 1741 made his first appearance as an actor. He did not venture at once to play in London, but went through a short probationary season at Ipswich, playing under the name of Lyddal. His first part was Aboan in Southerne's *Oroonoko*, which he chose because Aboan's black face disguised him and gave him greater confidence. He subsequently played with great success several other parts, including Harlequin. On 19th October 1741 he appeared in London at the theatre in Goodman's Fields, of which his friend Giffard was manager. Richard III. was his first character, and his success was so great that within a few weeks the two patent theatres were deserted, and crowds flocked to the unfashionable East-end playhouse. But Goodman's Fields had no license, so the managers of Drury Lane and Covent Garden set the law in motion and had the theatre closed. Garrick played at both the patent theatres, but ultimately settled at Drury Lane, of which he became joint-patentee with James Lacy in 1747. Until 1776 he continued to direct the leading theatre, and in that year he retired from the stage and from management, his successor in the direction of the theatre being Richard Brinsley Sheridan. During this period Garrick was himself the great attraction and played continually, his only long rest being a trip to the Continent from 1763 to 1765, at which time he fancied that his popularity was in danger of diminishing. His farewell appearance was made on 10th June 1776, when he played Don Felix in the comedy of *The Wonder*. He died on 20th January 1779, and was buried in Westminster Abbey, where a hideously theatrical monument was erected to his memory. As an actor, Garrick occupies the first rank. At his coming the stage was given over to formality and tradition, but these disappeared before the new actor whose leading characteristic was naturalness. He possessed also the most astonishing versatility, being equally at home in tragedy, comedy, or farce—in Lear, Don Felix, or Abel Drugger. As a man, he has been charged with meanness, vanity, and petty jealousy; but his faults of character were grossly exaggerated by those who envied his fame, and they were more than balanced by his many excellent qualities. Garrick's dramatic productions, some forty in number, are of minor importance, but some of his numerous prologues and epilogues are excellent. Garrick married in June 1749 a good and excellent woman, Eva Maria Violette, the celebrated dancer. She long survived him, dying in 1822, at the great age of ninety-seven. See Fitzgerald's *Life of David Garrick* (1868), and that by Joseph Knight (1894).

Garrison, WILLIAM LLOYD, journalist and abolitionist, was born at Newburyport, Massachusetts, December 10, 1805. His father was a man of literary taste and ability, but, falling into dissolute habits, deserted his wife, who, to support her family, had to turn professional nurse. William, who had previously tried shoemaking and cabinet-

making, was apprenticed to the printer of the *Newburyport Herald*, an occupation which suited his taste; he soon made himself master of the mechanical part of the business, and when only sixteen or seventeen began to write for the *Herald*. His contributions, which were anonymous, were favourably received, and he soon commenced to send articles to the *Salem Gazette* and other papers, drawing the attention of political circles by a series of articles under the signature Aristides, with the view of removing the almost universal apathy on the subject of slavery. In 1824 he became editor of the *Herald*, and some of J. G. Whittier's earliest poems were accepted by him, while their author was yet unknown to fame. After two or three other attempts, in 1829 he joined Mr Lundy at Baltimore in editing the *Genius of Universal Emancipation*. The vigorous expression of his anti-slavery views in this last paper led to his imprisonment for libel, from which he was released by Mr Tappan, a New York merchant, who paid his fine. He now prepared a series of emancipation lectures, subsequently delivered in New York and other places. He returned to Boston, and in 1831 started the *Liberator*, without capital or subscribers, a paper with which his name is inseparably associated, and which he carried on for thirty-five years, until slavery was abolished in the United States. For the first few years the mail brought hundreds of letters to Garrison, threatening his assassination if he did not discontinue this journal; the legislature of Georgia offered a reward of 5000 dollars to any one who should prosecute and bring him to conviction in accordance with the laws of that state; in 1835 he was severely handled by a Boston mob, and the mayor of that city was constantly appealed to from the South to suppress his paper. In spite of all, he successfully persevered. In 1833 he visited Great Britain, and on his return organised the American Anti-slavery Society, of which he was afterwards president. He visited England again, in the furtherance of his anti-slavery opinions, in 1846 and 1848. The diverging views of the anti-slavery party, as to whether a political platform should be adopted, and as to the voting and speaking of women, rent the body for a time, but on 1st January 1863 Lincoln's proclamation of freedom to the slaves as a military measure placed the civil struggle on an anti-slavery basis. In 1865, when Garrison's labours had been completely successful, and after the total abolition of slavery in the United States, his friends presented him with 30,000 dollars (£6000) as a memorial of his services. In 1867 he was once more in England, and entertained at a public breakfast in St James's Hall. He died at New York, 24th May 1879. A bronze statue has been erected to his memory in Boston. Some *Sonnets and other Poems* by him were published in 1847, and *Selections from his Writings and Speeches* in 1852. See Johnson's *William Lloyd Garrison* (1882); *William Lloyd Garrison: the Story of his Life*, by his children (4 vols. 1885–89); and poems to his memory by both Whittier and Lowell.

Garrot, a name applied to various ducks—e.g. to *Fulix clangula* and *Harelda histrionica*. See DUCK, WILD FOWL.

Garrotte (Span. *garrote*, 'a stick or cudgel'), a mode of execution practised in Spain and the Spanish colonies. Originally it consisted in simply placing a cord round the neck of a criminal, who was seated on a chair fixed to a post, and then twisting the cord by means of a *stick* (whence the name) inserted between the post and the back of the neck, till strangulation was produced. Afterwards a brass collar was used, containing a screw, which the executioner turned till its point entered the spinal marrow where it unites with the brain, causing instantaneous death. In its primitive form it exactly resembles the punishment of the bow-string in use among Mohammedan nations.—Garrotting is also the name given in Britain to a species of robbery which became rather common in the winter of 1862–63, and in which the robbers suddenly come behind their victim, and half-strangle him till their purpose is effected. An act passed in 1863 imposing Flogging (q.v.) as part of the penalty was effective in speedily suppressing the offence.

Garter, THE MOST NOBLE ORDER OF THE. This renowned order of knighthood was instituted by King Edward III., at what exact date has been matter of dispute, but most probably on 18th January 1344. Edward, having laid claim to the French throne, assumed the style of king of France. He had been partially successful in his first French campaign, and, meditating a second expedition, he resolved to institute an order of knighthood in honour of his successes past and to come, and as a means of rewarding some of his most distinguished comrades in arms. Hence the colour of the emblem chosen was blue, the French livery colour, and the motto, *Honi soit qui mal y pense* (i.e. 'Dishonoured be he who thinks ill of it'), was appropriate whether it applied to the French expedition or to the order itself. The tradition is that the choice of both emblem and motto was determined by a trivial incident. The Countess of Salisbury dropped her garter when dancing with the king, and the king, picking it up, tied it round his leg; but, observing the queen's jealous glances, he returned it to its fair owner with the remark, *Honi soit qui mal y pense*. The order was originally founded in honour of the Holy Trinity, the Virgin Mary, St George of Cappadocia, and St Edward the Confessor; but St George was always accounted its especial patron, so much that it has sometimes been called the 'Order of St George.' By the original constitution the Knights Companions were to be twenty-five in number exclusive of the sovereign, and were to assemble yearly on the eve of St George in St George's Chapel, where each was assigned a stall. Subsequent statutes authorised the admission into the order, in addition to the twenty-five companions, of foreigners of distinction, and such descendants of George II. (extended to descendants of George I. in 1831) as should be elected, always excepting the Prince of Wales, who was of necessity a companion; also of extra knights, which last, however, have always, on vacancies occurring, been incorporated into the number of the twenty-five companions.

The habits and ensigns of the order originally consisted of the garter, surcoat, mantle, and hood, to which were afterwards added the collar and George, the star, and the under habit.

This order has, unlike all others, for its principal emblem neither chain nor badge, but the *garter*, which, at first of light-blue silk with the motto sometimes set in pearls, rubies, and diamonds, is now of dark-blue velvet about an inch wide, with the motto in gold letters. It is worn on the left leg a little below the knee; and when the sovereign is a queen, she wears it, as sovereign of the order, on the left arm above the elbow. The statutes forbade the companions to appear in public without it, yet in the effigies on their monuments it is often wanting. The practice of surrounding the armorial insignia of the companions with the garter began in the reign of Henry V.; and the first sovereign on whose tomb this usage was complied with was Henry VII. An embroidered garter with the motto of the order seems to have been formerly worn on the left arm of the wives of companions.

The manifold variations in the colour, form, and material of the mantle, surcoat, and under habit at different times need not be described here. As at present worn, the *mantle* is of purple velvet lined with white taffeta, having on the left shoulder the *badge* of the order, namely, a silver escutcheon charged with a red cross for the arms of St George, and encircled with the garter and motto, as in the annexed cut. In chapters it is worn over the uniform or court dress. The *surcoat*, a short gown without sleeves, is made of crimson velvet lined like the mantle with white taffeta. The *hood*, worn on the right shoulder of the mantle, and now a meaningless appendage, is made of the same velvet as the surcoat, and similarly lined. When it ceased to serve its original purpose of a covering for the head, a cap was introduced in its place, which is now ornamented with ostrich-feathers, and in the centre of them a lofty tuft of black heron's feathers, the whole attached to the hat by a clasp of diamonds.

Order of the Garter:
Star, Collar, and George, and Garter.

The *under habit*, introduced by Charles II., need not be described in detail, and the costume is completed by white silk hose and white shoes and red heels. The garter worn on the right leg is of white silver riband with a large silver rosette. The sword is straight, of an ancient pattern with a cross-guard hilt, all gilt, the scabbard of crimson velvet.

The *collar* was introduced by Henry VII., probably in consideration of a similar ornament being the principal ensign of the Golden Fleece and other orders instituted in the 15th century; but it was first ordered to be worn in 1544. It consists of twenty-six pieces in which interlaced knots of cords alternate with double roses, each surrounded with the garter and its motto, these roses being alternately white within red and red within white; and pendent from one of the roses is the *George*, or figure of St George piercing the dragon. The collar and George were appointed to be worn on all solemn feasts; and provision was also made for a lesser George to be worn on other occasions attached to a chain or lace of silk, for which was afterwards substituted a dark-blue riband. The lesser George is surrounded with the garter and motto.

In respect that the mantle on which are the arms of St George within the garter is only worn on special occasions, Charles I. in 1626 introduced another badge to be worn on the cloak or coat, in which the cross of St George (not in a shield) is surrounded by the garter, and, to make it more splendid, ordered the whole to be surrounded with rays of silver. While the badge worn on the ordinary dress, popularly known as the *star*, is thus irradiated, that on the mantle has remained unaltered.

On the occurrence of a vacancy, a chapter (consisting of the sovereign and six knights) is appointed to meet, in which the new companion is elected, the election being practically a form, and the choice lying with the sovereign. The knight elect, if at hand, appears and is invested. If absent, the garter and George are sent him by Garter King of Arms. In case of a foreign prince being elected, some person of distinction is sent along with Garter to invest him. In later times, the ceremony of election has often been dispensed with, the investiture taking place privately, and the ceremonies connected with installation are now done away with. Each knight has his stall in St George's Chapel, Windsor; the knight elect used to get his predecessor's stall, but a system of promotion has latterly been introduced. The garter-plates of the knights, containing their arms and style, remain permanently, and those placed there in the reign of Henry VII. rank among the most valuable heraldic relics in Europe.

The officers of the order are the Prelate, who has always been the Bishop of Winchester; the Chancellor, formerly the Bishop of Salisbury, now (in consequence of a change in the division of the respective sees) the Bishop of Oxford; the Registrar, who is the Dean of Windsor; Garter King of Arms; and the Gentleman Usher of the Black Rod.

Knights of the Garter write K.G. after their names. Though the military character of this fraternity no longer exists, it has retained till the present day its pre-eminence among the orders of knighthood of Europe. For two centuries past the twenty-five companions have been almost exclusively peers or the eldest sons of peers. See Ashmole's *Institution, Laws, and Ceremonies of the Order of the Garter* (1672); and Sir Harris Nicolas' *History of British Orders of Knighthood* (1842).

Garth, Sir Samuel, an eminent physician and fair poet, was born at Bowland Forest in Yorkshire in the year 1661. He studied at Peterhouse, Cambridge, graduated M.D. in 1691, and next year settled in London, where he soon became famous as a physician and conversationalist. In the year 1700 he did himself everlasting honour by providing burial in Westminster Abbey for the neglected Dryden, and pronouncing a eulogium over his grave. On the accession of George I. he was knighted and appointed physician in ordinary to the king, and physician-general to the army. He died in London, January 18, 1718. Garth is best known in our literary history as the author of *The Dispensary* (1699), a mock-heroic poetical satire on those apothecaries and physicians who opposed the project of giving medicine gratuitously to the sick poor. The poem was exceedingly popular, but has long since ceased to interest a reader. In 1715 he published his topographical poem entitled *Claremont*, in imitation of Denham's *Cooper's Hill*, and in 1717 he superintended and contributed to a translation of Ovid's *Metamorphoses* by Addison, Pope, Gay, Congreve, Rowe, and other eminent contributors. Garth is now interesting chiefly for his versification as a connecting link between Dryden and Pope.

Gartsherrie. See COATBRIDGE.

Gas and Gases. Gas, a term applied by Von Helmont (1577–1644) to vapour not yet shown to be condensable, and possibly suggested by the Dutch *geest*, 'spirit,' 'ghost.' It now signifies either (1) a vaporous substance not condensed into a liquid at ordinary terrestrial temperatures and pressures, or (2) one which at ordinary temperatures is not condensable into a liquid by pressure alone. In both these senses, air under ordinary atmospheric conditions is a gas; when cold enough it is not a gas but a vapour, and pressure alone can then condense it. Sulphurous acid gas is ordinarily gaseous, but it is a 'vapour' because pressure alone will condense it at ordinary temperatures. Above 30·92° C. (87·67 F.) carbonic acid is a true gas; no pressure will then liquefy it; but at 30·92° C. a pressure of 77 atmospheres, and below 30·92° C. progressively smaller pressures will condense it; at and below that temperature (Andrews's Critical Temperature) gaseous carbonic acid is a 'vapour,' condensable by pressure alone. Saturated steam is, in the same sense, a permanent gas at all temperatures above 720·6° C.; it cannot be liquefied by pressure unless its temperature be below that limit. The critical temperature for hydrogen is −240·4° C. Hydrogen alone among gases resisted condensation till 1898, when it was liquefied at −238° C. (Dewar), this result being followed in 1899 by its solidification at −261° to −260° C. (Dewar). It had been believed that Messrs Cailletet of Paris and Raoul Pictet of Geneva had, in 1877, succeeded in condensing hydrogen as well as all the other gases then believed to be non-condensable; but this on further investigation was found to be incorrect. Liquefied air was made available for various industrial uses—as a motor, for example, its expansion being utilised; it is also sold like oxygen in iron tubes.

Gases have small densities: hydrogen has, compared with water, a density, at 0° C. and 760 mm. barometric pressure (32° F. and 29·922 in.), of 0·0000895682, and air a density of 0·0012932. Taking hydrogen as a standard, oxygen is very nearly 16 times, nitrogen 14, air 14·47, carbonic acid 22 times as heavy.

Gases have no free surface-boundary, but occupy any space within which they may be confined. The smaller the space within which a given quantity of gas is confined, the greater is the expansive pressure which it exerts on the walls of the containing vessel; approximately, for a given quantity at a given temperature, the pressure varies inversely as the volume (Boyle's Law, Mariotte's Law), or the pressure multiplied by the volume gives a constant product: $pv = c$. This law is fairly well obeyed by such gases as air; but in all gases, other than hydrogen, it is observed that there is with progressively increasing pressures a fall in the value of the product $p\,v$, which attains a minimum and then rises; and even with hydrogen the apparent exception has been removed by the labours of Wroblewski, who found that at very low temperatures the same phenomena were observed in that gas; and that, in general, if we draw curves representing, for a series of gases, the respective pressures at which the minimal values of $p\,v$ occur at various temperatures, then if our diagrams are so plotted out as to represent the respective temperatures and pressures in terms not of degrees or millimetres, but as multiples of the critical temperature (measured from −273° C. as absolute zero) and of the corresponding critical pressure of each gas, the curves are, for all gases, the same. Under circumstances which are similar with respect to the critical temperature and pressure, therefore, all gases behave similarly in this respect; and hydrogen acts at −183° C. (the temperature of boiling oxygen), but not at −103·5° C. (the temperature of boiling ethylene), like air and other gases at ordinary terrestrial temperatures. Carbonic acid gas, in order to act like hydrogen at −103·5° C., must be at a temperature of about 1287° C.; both are then at a temperature about five times their respective critical temperatures, measured from absolute zero. When the temperature of a given quantity of gas is altered, the product $p\,v$ is altered so as, to a first approximation, to be proportional to the absolute temperature (−273° C. = 0° Abs.). There are, however, some abnormalities: keep the pressure constant and let the volume increase, and we have a certain coefficient of expansion under constant pressure, which is approximately $\frac{1}{273}$ of the bulk at 0° C. for each C. degree of increase in temperature; keep the volume constant and let the pressure increase, and we have a coefficient of increase in expansive pressure, which ought to be the same and is very nearly the same as the previous coefficient; but not exactly so. The former coefficient is, except in hydrogen, a very little larger than the latter; in the readily condensable gases the product $p\,v$ rises more rapidly than the absolute temperature; and with progressively ascending pressures, the rate of increase of $p\,v$ itself rises more markedly in the easily condensable gases than in air. These phenomena indicate the existence of inter-molecular forces between the particles of a gas, which manifest themselves the more clearly the nearer is the approach towards liquefaction; when the liquid state has been reached there is cohesion within the liquid. That gases are compressible by increase of pressure above the atmospheric, as well as dilatable by diminution of pressure, follows from what has been said; if the pressure be doubled the volume will be halved, and *vice versâ*. When gases are compressed, work is done upon them, and the compressed gas tends to expand; when the pressure is wholly or partly relieved, the gas expands and does work, as in the air-gun or in compressed-air machines. The pressure at all points in the same horizontal level is, or soon becomes, the same; whence, if pressure be applied to one part of a mass of gas, the pressure is soon transmitted throughout the whole, and thus energy may be conveyed, even to considerable distances. The restitution-pressure tending to cause expansion is equal to the external pressure applied, and the coefficient of elasticity is at all temperatures, provided there is no change of temperature during the compression, numerically equal to the pressure; while if the compression could be so conducted as to allow absolutely *no* heat to escape, the elasticity, in air, would be numerically 1·406 times as great as the pressure. Through this elasticity of gases, local displacements set up wave-motions, which, mostly in air, are the usual cause of sound. The speed of propagation of such waves (unhampered by boundary walls) is equal to the square root of the quotient of the coefficient of elasticity divided by the density; and thus the velocity of sound is, within the same gas, independent of the pressure (for the pressure and the density are directly proportional to one another). It is, however, directly proportional to the square root of the absolute temperature.

According to Dalton's Law, when a number of gases are mixed, each exerts its own pressure according to the quantity in which it is present; this law is the less perfectly obeyed the nearer the gases are to their condensing temperatures, and the greater their mutual solvent action. When a gas is greatly rarefied, a small mass holds possession of a relatively great space; such a space is called a *vacuum*, which in fact it is not, for two reasons—that the ether of space is not eliminated, and that traces of the gas (one hundred-millionth of an atmosphere in the

best vacua are always retained. If two gases be placed at different levels in a vessel, even with the lighter gas uppermost, they will rapidly diffuse into one another, and even if connected only by a long glass tube they will soon mix, and will not there after separate. This is due to molecular movement, and dust particles are not appreciably transferred; thus the dust of a closet is not removed, though the air is renewed, by opening the door. If, however, the two gases to be exchanged be of notably different densities, there may be a pressure resulting from the tendency of the lighter gas to pass more rapidly into the heavier than the heavier one travels into it. The rate of mixing by diffusion between two gases is measured by their coefficient of diffusivity, which is to be experimentally found. The significance of this coefficient is that where we, adopting a consistent system of units, say centimetre, gramme, and second, state in the shape of a formula the known laws of gaseous diffusion—viz. that (1) the quantity of matter transferred across any layer is inversely proportional to the thickness of that layer, (2) that it is directly proportional to the area exposed, (3) directly proportional to the time taken, and also (4) to the difference of densities on either side of the layer—we may convert this formal statement of proportions into a numerical identity by inserting the proper numerical factor or coefficient; thus if M be the number of grammes transferred, *ab* the area exposed in sq. cm., *c* the thickness of the layer, *t* the time, and *d* the difference of densities, M is proportional to $\frac{ab.t.d}{c}$, or equal to $k.\frac{ab.t.d}{c}$, where *k* is the coefficient of diffusivity. But *k* becomes a different number when we change our units of length or time; it varies numerically according to the square of the unit of length, and inversely according to the unit of time adopted, and hence the coefficient of diffusivity is usually stated as being so many square centimetres per second. Some numerical values for this coefficient will be found in Clerk-Maxwell's *Theory of Heat* (appendix).

Diffusion in gases has also been measured in another way. Hydrogen separated from the outer air by a plaster-of-Paris plug, escapes into the air about four times as fast as air traverses the plug in order to get into the hydrogen. The law is that the rate of traversing the plug is inversely proportional to the square root of the density of the gas; or, in terms of the kinetic theory of gases, it is directly proportional to the average velocity of the molecules of each gas. The rates at which gases will traverse a single small aperture ('effusion') are, within the limits of experimental error, in accordance with the same law. The rates at which gases slowly pass under pressure through extremely fine long tubes, or are 'transpired,' have no relation to the diffusion or effusion rates; the mass of gas passing per second varies as the motive pressure, as the density, and inversely as the length of the tube, and also as a coefficient of transpiration special to each gas, and presenting from gas to gas certain coincidences as yet unexplained (see Graham's *Collected Works*, or Miller's *Chemical Physics*). The rate is slower the higher the temperature, but is independent of the material of the tube.

When gases are separated by membranes, in which they are unequally soluble, or for which they have unequal affinities, the diffusion-rates are interfered with and become abnormal—e.g. benzol-vapour and air separated by a thin india-rubber membrane; the benzol traverses, the air does not. Thus also carbonic oxide, an extremely poisonous gas, may traverse red-hot cast-iron, a fact to be kept in mind in reference to overheated stoves. This is due to solution of the gas in the solid, which behaves like a liquid film in reference to it. Gases are also condensed on the surface of solids; every solid object bears a condensed film of air on its surface; some substances have enormous power of condensation, notably cocoa-nut charcoal (Hunter), which absorbs 170 times its own volume of ammonia, 69 of carbonic acid, 44 of water-vapour. This power is beneficially utilised in charcoal respirators, in which oxygen and oxidisable gases are condensed together and combine; and in Döbereiner's hydrogen lamp, in which hydrogen plays upon platinum black, and is condensed so rapidly (perhaps being oxidised at the same time) that the platinum becomes incandescent and ignites the hydrogen jet.

The superficial film of air on solids plays a part in friction in air; a pendulum has the amplitude of its swing slightly diminished by this friction: a waterfall drags air down and is retarded by this frictional action; and the examples of railway trains and cannon-balls will readily occur. The slide-valve of a steam-engine is pressed upon by the steam, and this gives rise to friction.

Gases are in many cases soluble in liquids; some are greatly so (ammonia in water at 0° C., 1049·6 volumes; at 20° C., 654 volumes), some slightly (hydrogen in water at 0° C., 0·0193 volume). The general rule is (Henry's Law) that, at any given temperature, the volume of gas dissolved is constant at all pressures, so that the quantity of gas dissolved is proportional to the pressure; and on liberation from pressure some of the gas escapes. This law is interfered with in most cases by the formation of chemical compounds (hydrates) between the water and the gas dissolved. Again, when a mixture of gases is presented to a liquid, the general rule is that each is dissolved in proportion to the partial pressure exerted by it, combined with its own specific solubility in the liquid: thus the small quantity of air dissolved in water, which subserves the respiration of aquatic life, contains 34·82 per cent. of oxygen instead of 20·9 per cent., as air does, because oxygen is more soluble in water than nitrogen is. Where, however, the gases have a mutual chemical action, this rule is completely departed from. One effect of the formation of hydrates may be that the gas is not expellable by boiling: hydrochloric acid gas is an example: a certain excess of gas may be driven off by heat, but beyond that the aqueous solution of hydrochloric acid distils over as a whole: ammonia gas or carbonic acid, on the other hand, may be completely driven off from water, any feeble hydrates formed being decomposed. Gases may, it appears, dissolve gases; oxygen evolved from chlorate of potash may (Schützenberger) contain chlorine unrecognisable by any chemical test until a red heat has been applied; and it seems that there is no case of evaporation without the vapour carrying off some of the solids dissolved in the evaporating liquid, a phenomenon specially observed in the case of boracic acid solutions, and also in the case of coal-gas, which may, especially when rich in the vapour of liquid hydrocarbons, carry much solid naphthaline in a state of invisible suspension approximating to true solution.

Gases are to a certain extent viscous; air or steam in motion will drag the surrounding air along with it, and will thereby have its own motion checked. Wave-motion set up in air may travel far, but has at length its energy worn down into heat through the viscosity of the air. Air is at 0·6° C. about a hundred times less viscous than water is, and at 90° C. it is only about twelve times less viscous than water at that temperature. The viscosity of any given gas, dynamically measured, does not vary with its density.

Gases also possess a feeble power of conducting

heat by a kind of diffusion and redistribution of energy of heat-motion. In hydrogen a heated wire is very rapidly cooled; in a heavier gas, less rapidly so. The conductivity of air, when the heat conducted is reckoned in units such that each will raise a cubic cm. of the substance (air) itself through one degree Centigrade, is 0·256; under similar conditions that of iron is 0·183, and that of copper is 1·077; so that the rate of propagation of thermal effects in air is intermediate between that in iron and that in copper. This apparently high rate is due to the small density of air and to its low specific heat; and when we turn to the actual propagation of heat-energy as distinguished from that of temperature, we find the conductivity of air, in this sense, to be only about one 20,000th that of copper.

Gases have as a rule small specific heat: air has at constant pressure a specific heat = 0·2375, at constant volume, 0·1684; that is, to raise a pound of air 1°, allowing it to expand, takes 0·2375 as much heat as it would take to raise a pound of water, whereas if it be not allowed to expand and thereby absorb energy, it will take only 0·1684 times as much. The specific heat of gases is stated in tables with reference to 'air = 0·2375' as a starting-point; an equal *volume* of hydrogen has a specific heat at constant pressure = 0·2359, and, roughly, equal volumes of all the ordinary gases have equal thermal capacities; but ordinary vapours have, volume for volume, much greater thermal capacities than ordinary gases. Hydrogen has a specific heat, weight for weight, 3·0490 times (at constant pressure) as great as water; and it is the solitary exception to the statement that water has of all substances the highest specific heat. In general the specific heat of a gas at constant pressure is about 1·4 times its specific heat at constant volume; in the latter case no heat is absorbed in doing the work of expansion against resistance. The specific heat of gases rises slightly with increasing temperature (Mallard and Le Châtelier), and this becomes at furnace heats very well marked: at 2000° C. the specific heats of carbonic acid and water-vapour are double, and those of nitrogen, oxygen, and carbonic oxide about one and a half times as great as what they are at 200° C.

Different gases have different actions upon radiant heat and light; they characteristically absorb special portions of the heat and light spectrum, and thus produce absorption bands: the dark lines A and B seen in the solar spectrum are traced by Egoroff and Khamantoff to the absorptive action of oxygen. In some gases the absorption is carried so far that the gas appears coloured—e.g. chlorine, which is yellowish-green; iodine vapour in comparatively thin layers allows only red and blue light to pass, and thus appears purple; in thicker layers only blue light passes. On the whole, however, gases are poor absorbents and correspondingly poor radiators: there is comparatively little radiation from a Bunsen flame. At the same time the radiation from an incandescent gas tends to be very precise in its frequencies; it tends to produce line-spectra as distinguished from the continuous spectrum produced by the mutually jolting particles of an incandescent solid. Each gas has its own index of refraction also; oxygen has, for example, as compared with vacuum, a mean index at atmospheric pressure of 1·000272. In vapours the dispersion is great; and iodine vapour strangely refracts red most and violet least.

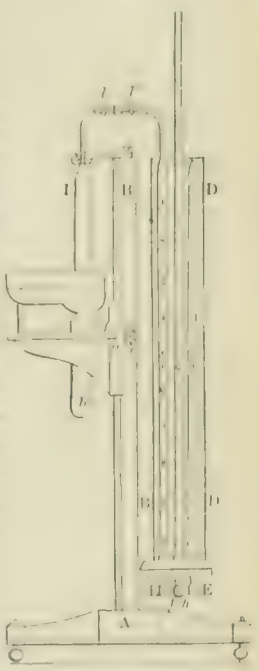
In Electricity (q.v.) the different gases have different properties which sometimes present curious anomalies; air at ordinary pressures is an insulator; warm air at rest is an insulator, but above a Bunsen burner it is a conductor; at low pressures it conducts and glows while conducting; at extremely low pressures it is again an insulator. Different gases set up different potential-differences between themselves and metals with which they may be in contact, as in gas-batteries, and they have different specific inductive capacities.—Oxygen is magnetic in the same sense as iron; hydrogen and nitrogen are diamagnetic, and tend to lay themselves across the poles of a magnet. See also MATTER.

ANALYSIS OF GASES.—The gas is collected in small glass vessels, the contents of which, consisting of mercury, water, or air, are displaced by the gas to be analysed. For the best methods of collecting gases from mineral springs and waters, from volcanic lakes, geysers, or boiling springs, from openings in rocks, clefts of glaciers, furnaces, fissures in volcanic craters, &c., reference may be made to Bunsen's *Gasometry*, translated by Roscoe. Air is only used when a considerable current of the gas to be analysed can be procured, which may sweep out the last traces of air from the collecting vessel. Water often affects the composition of mixed gases which it is attempted to collect over it; for to various extents it absorbs, among others, hydrochloric, hydriodic, hydrobromic, and sulphurous acid gases, chlorine, sulphuretted hydrogen, ammonia, fluoride and chloride of boron, methyl- and ethyl-amine, methyl chloride and methyl ether, cyanogen, and chlorine cyanide; and it decomposes silicon fluoride with precipitation of gelatinous silicic acid. Mercury is generally employed because it is inert to most gases; but it is attacked by chlorine, which it absorbs.

There are two leading principles made use of in the analysis of gases. First, a given volume is subjected to a chemical reaction, which results in the *condensation* of one of the constituents of the gaseous mixture or compound; then by simple observation, or from the known laws of gaseous volume, it is determined how great a volume of the original gas has disappeared through being amenable to the reaction employed, and, accordingly, how great a proportion of the constituent in question was originally present. In the case of air, for example, a measured volume may be exposed to the absorptive action of a strong alkaline solution of pyrogallol; the solution becomes dark; the oxygen is absorbed; the original volume of air is diminished; the loss of volume is ascertained, and represents the quantity of oxygen originally present in the measured volume of air. Or again, if the mixture of gases be a somewhat more complicated one, as, for example, a mixture of carbonic acid and oxide, olefiant gas, and oxygen, the various absorbent reagents appropriate to each constituent may be successively introduced, and the successive shrinkages noted by remeasurement at the original temperature and pressure. A few drops of a solution of caustic potash will in this way take up the carbonic acid; pyrogallol will take up the oxygen; anhydrous sulphuric acid dissolved in oil of vitriol, and introduced on a coke-pellet, will slowly take up the olefiant gas, and the sulphurous acid and anhydrous sulphuric acid vapour, which contaminate the gas after this reaction, may be removed by caustic potash; and carbonic oxide may be absorbed by means of a solution of cuprous chloride (prepared by leaving copper turnings with a saturated solution of cupric chloride in a stoppered bottle for some days), which will take it up in about ten minutes. The principal absorption reagents are (1) caustic potash solution, which absorbs sulphuretted hydrogen, hydrochloric, carbonic, sulphurous, and other acid gases, chloride and fluoride of boron, and chloride of cyanogen, and decomposes siliciuretted hydrogen with evolution of 4 volumes of hydrogen; (2) dry caustic potash, which acts like the solution, but more slowly, and also absorbs

water vapour; (3) alcoholic solution of caustic potash, which also absorbs bisulphide of carbon; (4) alkalinised solution of pyrogallol—oxygen; (5) phosphorus—oxygen; (6) cuprous chloride dissolved in hydrochloric acid—oxygen, carbonic oxide, acetylene, and allylene; (7) the same dissolved in ammonia, which absorbs also the hydrocarbons of the olefine series; (8) dilute sulphuric acid—ammonia, methylamine, and other amines; (9) strong sulphuric acid—water, alcohol, methyl ether, propylene and its homologues; ethylene slowly, hydrogen and marsh gas not at all; (10) Nordhäusen sulphuric acid, which absorbs the olefines, not hydrogen or the marsh-gas series; (11) concentrated aqueous solution of sulphate of iron, which absorbs nitric oxide; (12) bromine, which in presence of water acts like Nordhäusen sulphuric acid; (13) sulphur, which absorbs sulphuretted hydrogen, sulphurous acid, and bisulphide of carbon; (14) chromous sulphate, to which ammonium chloride and ammonia have been added, absorbs oxygen, nitric oxide, acetylene, and allylene; (15) alcohol absorbs chloride of cyanogen, methyl chloride, methyl ether, and cyanogen; (16) mercuric oxide—cyanogen; (17) lead acetate—sulphuretted hydrogen; (18) lead peroxide—sulphurous acid. Analyses conducted by the aid of such reagents are direct; and on the same principle of observation of shrinkage we may also employ explosion-reactions. In the case of air we take a measured volume and add to it about half its bulk of hydrogen, observing precisely what volume we add. In this case the graduated tubular vessel, in which the gas is contained, has two platinum wires fused into it so as to approach one another within the vessel; our vessel is then called a Eudiometer. An electric spark is made to leap across the interval between the two wires; an explosion occurs; part of the hydrogen of the mixture combines with the whole of the oxygen; presently the aqueous vapour formed condenses, and the volume of the mixture becomes, at the former temperature and pressure, considerably less than it was before the explosion. The shrinkage is measured; the gas which has disappeared consisted, for every three volumes, of two of hydrogen and one of oxygen. One third of the shrinkage, therefore, represents the amount of oxygen present in the air acted upon; and in the case of air the balance of the original volume is taken (if the air had been freed from moisture and carbonic acid) as consisting wholly of nitrogen (including argon). In more complicated mixtures the explosion-reactions lead to more complicated processes and calculations. For example, if we have a mixture of hydrogen, methane, carbonic oxide, and nitrogen (which corresponds to coal-gas that has been passed through potash solution and has stood over strong oil of vitriol), we first explode a known volume of the mixture with an excess of oxygen. The shrinkage is observed, and then potash solution is introduced in order to remove the carbonic acid formed by the combustion of the methane and the carbonic oxide. The nitrogen alone now remains, together with the excess of oxygen; and the amount of the latter is determined by another explosion with hydrogen, whence the amount of nitrogen may be determined; and from this we find the volume of combustible gas originally present in the mixture. We now know (1) the volume originally used (A); (2) the volume of combustible gas therein contained (B); (3) the contraction of volume on explosion (C); and (4) the volume of carbonic acid generated on explosion (D). We also know that when hydrogen is exploded with an excess of oxygen the combustion of one volume of hydrogen causes the condensation of $1\frac{1}{2}$ volume of the mixture; that the combustion of 1 volume of carbonic oxide similarly causes a shrinkage of $\frac{1}{2}$ volume, and the production of 1 volume of carbonic acid; and that the combustion of 1 volume of methane (light carburetted hydrogen, marsh-gas, CH_4) produces a shrinkage of 2 volumes and the formation of 1 volume of CO_2. Hence we find that the shrinkage C is made up of the original H volume $\times 1\frac{1}{2}$, *plus* the CO volume $\times \frac{1}{2}$, *plus* the CH_4-volume $\times 2$; and that the carbonic acid (= D) is equal to the CO-volume *plus* the CH_4 volume; and if we set down these statements algebraically, writing w for the original volume of nitrogen, x for that of hydrogen, y and z for those of carbonic oxide and marsh-gas, we have the equations A $= w + x + y + z$: B $= x + y + z$: D $= y + z$: and C $= \frac{3x}{2} + \frac{y}{2} + z$, from which w, x, y, z may be readily found and thereafter reduced to percentages. If any of these quantities, w, x, y, z, be found equal to 0 (or to a small negative quantity), the corresponding gas is not present in the mixture.

The apparatus made use of varies from a simple graduated tubular vessel to the more elaborate compensating apparatus now in use. The object of compensation is to enable the volume of the gas to be ascertained without calculation for correction. We may refer by way of illustration to the apparatus of Frankland and Ward, which is fully explained in Williams' *Handbook of Chemical Manipulation*, as well as in Messrs Frankland and Ward's memoir in the *Quarterly Journal of the Chemical Society*. We take as an example an explosion-analysis of atmospheric air. A few (three or four) cubic inches of air, freed from carbonic acid, having been introduced into the tube, I, it is transferred into F for measurement by opening the cocks, l, l', and placing the tube, F, in connection with the exit-pipe, h; the transference can be assisted, if necessary, by elevating the mercurial trough, C. (The part marked b in the figure is merely the tubular well of the mercurial trough, C.) When the air, followed by a few drops of mercury, has passed completely into F, the cock, l, is shut, and f turned, so as to connect F and H with h. Mercury is allowed to flow out until a vacuum of two or three inches in length is formed in H, and the metal in F is just below one of the graduated divisions; the cock, f, is then reversed, and mercury very gradually admitted from G, until the highest point in F exactly corresponds with one of the divisions upon that tube; we will assume it to be the sixth division, there being ten divisions in all. This adjustment of mercury, and the subsequent readings, can be very



A, a tripod, with levelling screws; BB, a vertical pillar, to which is attached C, a mercurial trough, movable by a rack and pinion, *m*; DD, a glass cylinder, 36 inches long, with an internal diameter of 4 inches, containing three tubes, F, G, H, which communicate with one another, and with the exit-pipe, *h*, by the apparatus E, E. The rest of the figure will be sufficiently intelligible from the description given in the text.

accurately made by means of a small horizontal telescope, placed at a distance of about six feet, and sliding on a vertical rod. The height of the mercury in H must now be accurately determined; and if from the number thus read off the height of the sixth division above the zero of the scale in H is deducted (the scale on H is not marked in the figure), the remainder will express the true volume of the gas, no corrections being required for variations of temperature, atmospheric pressure, tension of aqueous vapour, &c.

Hydrogen, in the proportion of half the volume of the air used, must now be passed into I, and from thence into F, when the volume of the mixed gases must be again determined as before. An electric spark must now be passed through the mixed gases in F by means of the platinum wires at *m* (near the top of F). A slight explosion occurs, after which we observe a considerable contraction in the volume of the mixed gases, and one-third of this shrinkage represents the volume of oxygen.

The objection to this kind of gas-analysis is its comparative slowness. When we wish to control the process of coal-gas-making, it is necessary to collect a series of specimens during the progress of the decomposition, but the results of gas-analysis are rarely available with useful expedition. Where it is sufficient to trace up one special constituent, such as sulphuretted hydrogen in coal-gas or carbonic acid in ventilation-experiments, results of considerable value may be attained by passing known volumes of the gas through a known quantity of a test-liquid, or shaking it up with it, and measuring by *titration* the amount of the reagent unaffected by the particular constituent of the gas; or, more rapidly, by the gradual addition of one to the other until the mutual reaction ceases. For instance, 100 cubic cm. of crude coal-gas may have successive instalments of a dilute solution of iodine of known strength brought into contact with it; when the reaction ceases the iodine solution ceases to be decolorised by the sulphuretted hydrogen, and if starch be present a blue tint will be struck.

Gas. Lighting and Heating By, depend mainly on the presence of gaseous heavy hydrocarbons in the gas. Pure hydrogen and even pure methane give no light, and, volume for volume, they give little heat, though their flames are flames of high temperature. When illuminating gas is ignited it burns with a flame which is luminous for two reasons: (1) the hydrocarbons form acetylene, which upon becoming highly heated decomposes explosively with a bright flash; and (2) the hydrocarbons are partly decomposed, and leave highly carbonaceous molecular residues which, becoming highly heated in the flame, incandesce and become luminous. I. *Coal-gas* is produced by the simple distillation of dry coal. Anthracite coal is unsuitable; brown coal and lignite are unsatisfactory: the greatest yield of the best gas is obtained from highly bituminous coals, although these are expensive and leave as residue inferior coke, mainly ash; practically the most useful gas-coal is that which will, either alone or mixed with bituminous coal, yield a fair quantity of good gas and leave good coke in the retorts. The very highly bituminous coals are only used for mixing with ordinary coal: the ordinary bituminous or cannel coals are sometimes used, especially in Scotland, for making richer gas of 25 to 30 candle-power (in standard burners burning 5 cubic feet per hour), but are usually mixed with ordinary coal with the view of improving the coke produced. The ordinary caking coals of the north of England are mainly used in England, mixed with a proportion of cannel or of highly bituminous coal or shale in order to improve the gas, which is generally supplied with an illuminating power of from 16 to 20 candles. The gas-coal used on the Continent is intermediate between caking coal and cherry coal, and gives gas of from 12 to 17 candles. By bituminous coal is not meant coal which actually contains bitumen, but coal which contains carbon and hydrogen in a proportion suited to the formation of heavy hydrocarbons when the coal is exposed to heat: no bitumen can be dissolved by alcohol out of a so-called bituminous coal. The proportions of hydrogen and oxygen to the carbon in various materials is shown in the following table:

	Carbon, per cent.	Hydrogen, per cent	Oxygen, per cent	Hydrogen per 100 carbon	Oxygen per 100 carbon
French anthracite	94	1·49		1·6	
Glamorgananthr.	91·5	3·5	2·6	3·8	2·8
Newcastle gas-coal	82·1	5·3	5·7	6·4	6·9
Wigan cannel.	79·2	6·1	7·2	7·7	9·1
Boghead mineral	63·93	8·86	4·70	13·8	7·4

The hydrocarbons which enable the gas to give a luminous flame depend for their formation upon the presence of hydrogen: oxygen, on the other hand, is detrimental; it takes up hydrogen to form water, and with carbon it forms carbonic acid and carbonic oxide. Anthracite distilled gives no useful result; Newcastle gas-coal gives, per ton, a little over 10,000 cubic feet of gas, of an illuminating power ranging between 14 and 20 candles; Scotch cannel, 10,600 feet, of 30 candles; Scotch Boghead, distilled alone, 13,000 feet, of 40 candle, or 15,000 feet, of 35 candle; and Australian Boghead, 14,000 feet, of 50 candle-gas. These are given merely as typical examples; the results vary greatly according to the temperatures employed and the duration of the exposure to heat. Newcastle cannel coal, for example, if distilled between 750° and 800° F., yields, per ton, 68 gallons of crude oil (whereof may be recovered—paraffin spirit about 2 gallons; lamp-oil, 22½ gallons; heavy oil and paraffin, 24 gallons), 1280 lb. of coke, and only 1400 cubic feet of gas; whereas, when it is distilled for gas in the usual way, it yields, besides the coal-gas, 18½ gallons of coal-tar (wherefrom 3 pints benzol, 3 pints coal-tar naptha, and 9 gallons of heavy oils, naphthaline, &c.), and 1200 lb. of coke. Protracted distillation at high heats causes the evolution of hydrogen rather than of hydrocarbons; high heats in general cause the production of volatile rather than of condensable hydrocarbons, and this results, if not carried to excess, in a decided advantage—viz. that the gas produced, though of lower quality than the smaller quantity produced at low heats, is greatly less liable to lose its illuminating power by condensation and deposition of hydrocarbons on the way to the consumer. Very roughly, the candle-power is, within a limited range, inversely proportional to the number of feet of gas made (at a given temperature) from a given quantity of coal. Thus, if a ton of coal give 10,000 cubic feet of 15¾ candle-gas, then, if the distillation be protracted so that 10,500 feet are produced, the candle-power will sink to 15. Tieftrunk calculates the percentage composition (in volumes) of the gas which comes off in successive hours thus:

	1st hour	2d hour	3d hour	4th hour.	5th hour
Heavy hydro-carbons	13	12	12	7	..
Marsh-gas	82	72	58	56	20
Hydrogen	..	8·8	16	21·3	69
Carbonic oxide	3·2	1·9	12·3	11	10
Nitrogen	1·3	5·3	1·7	4·7	10
Relative volumes	1	0·485	0·387	0·105	..

Distillation is thus after the fourth hour practically disadvantageous to illuminating power.

The products of distillation of coal, as usually performed in gas-works, are very numerous. The principal of them are marsh-gas, hydrogen, carbonic oxide, carbonic acid, nitrogen, oxygen, sulphuretted hydrogen, ammonia, hydrocyanic acid, bisulphide of carbon, and other organic sulphur compounds;

aqueous vapour; ethylene, propylene, butylene, acetylene, ditetryl, and allylene; caproyl, capryl and butyl hydrides; caprolene, œnanthylene; benzol, toluol, xylol, cymol; paraffin, naphthaline, anthracene, chrysene, pyrene; acetic acid, carbolic acid, cresol, phlorol, rosolic acid; aniline, pyridine, picolin, and several other nitrogenous alkaloid substances; with some hydrochloric and sulphurous acids. These substances have very different volatilities and solubilities; a large number of them may be separated from the gas by mere cooling, and together these form *coal tar*, which is a black viscous liquid, sp. gr. 0·98 (from cannel) to 1·15 (from ordinary coal), the yield of which is, from coal, up to 12 gallons, and from cannel up to 17 gallons per ton distilled, the average yield being scarcely 11 gallons. By careful distillation coal-tar yields successively the following products, the percentages of which vary widely in different gas-works: 2–4 per cent. of water, ammonia (which may be extracted from the tar by cold water), and volatile hydrocarbon vapours; 1·5 to 16 per cent. of light oils, including carbolic acid; 20–35 per cent. of heavy oils (creasote oils); 10–20 per cent. of anthracene oils, and a residue of 28–64 per cent. of pitch. The reason of this wide range of variation in the tar lies partly in the nature of the coal used, the temperature of distillation (the higher the heats the thicker the tars), and partly in the mode and temperature of condensation.

After the tar has been mostly deposited the gas is washed with water, which is converted into ammoniacal liquor, containing ammonia, carbonate of ammonium, sulphide of ammonium and some sulphite, chloride, and sulphocyanide of ammonium, and salts of nitrogenous alkaloids. After being cooled and washed the gas still contains carbonic acid, sulphuretted hydrogen, some hydrocyanic acid, and some bisulphide of carbon, and other sulphur compounds. Slaked lime, moistened so as to form a porous mass, will absorb the carbonic acid or sulphuretted hydrogen, but not the hydrocyanic acid and bisulphide of carbon so long as there is free carbonic acid present. Oxide of iron absorbs H_2S, becoming sulphide; and this, when re-exposed to the air, is re-oxidised, the oxide being regenerated, while free sulphur is formed mixed with the oxide; the oxide may be used over and over until the percentage of free sulphur rises to 50 or 56, after which the oxide is 'spent,' and is transferred for the sake of its sulphur to the manufacturing chemist. Spent oxide also contains Prussian blue, or ferrocyanide of iron, Fe_7Cy_{18}; this, together with sulphocyanide of iron, is formed from the hydrocyanic acid. Further, the free sulphur in the oxide arrests bisulphide of carbon and other sulphur compounds. The re generation of the oxide can be brought about by admitting a percentage, say 2, of air into the gas-stream. The oxygen of the admitted air is taken up in continuous regeneration of the purifying oxide. The disadvantage of this is that the residual nitrogen of the air tells against the illuminating power of the gas; but recently, since pure oxygen has become cheap, oxygen gas alone has been employed with very favourable results. One result of continuous revivication is, that the evil smells associated with the opening of purifiers have become unfamiliar in most works. When continuous regeneration is resorted to, the oxide does not become spent until it contains a considerably higher percentage (as much as 75) of sulphur. Iron oxide, however, does not remove carbonic acid, and Mr R. H. Patterson showed that complete purification might be secured by removing (1) CO_2 by means of lime (the carbonic acid having a stronger affinity for lime than sulphuretted hydrogen has, is retained in the first lime purifier, while H_2S either passes on directly or is driven off by the succeeding CO_2 from any temporary lodgment it may have gained in the first purifier); (2) H_2S by a second lime purifier, the resulting sulphide of calcium uniting with the bisulphide of carbon to form thiocarbonate of calcium ($CaS+CS_2=CaCS_3$, analogous to carbonate of calcium, $CaCO_3$), or rather a basic compound $CaCS_3CaH_2O_2.7H_2O$, and also with other sulphocarbon compounds; and (3) if necessary any remaining H_2S may be taken up by iron oxide. In 1888-89 Mr Valon found that if 0·6 per cent. of oxygen be added to crude gas, and if lime be used alone as the purifying agent, there is complete and simultaneous removal of the carbonic acid, sulphuretted hydrogen, and sulphide of carbon, the sulphur being separated in the free state and the gas-lime produced being entirely devoid of smell; while, owing to complete separation of the carbonic acid and through not introducing nitrogen, the lighting-power of the gas is at least 1½ candle better than when iron oxide is employed alone.

Purified gas contains, in percentages by volume:

	London ordinary Gas	London Cannel Gas	Boghead Gas
Heavy hydrocarbons	4·8	13	31·5
Marsh gas	32·0	50	48·4
Hydrogen	49	29·7	10·4
Carbon monoxide	7·5	4·8	4·6
Carbonic acid	3·7	0·4	..
Nitrogen	0·5	0·4	..
Aqueous vapour	2	2	..

London cannel gas is no longer made; and true Boghead mineral is no longer obtained in Great Britain, though large quantities of an equivalent substance are now shipped from Australia.

When coke is made in a beehive oven, the gas evolved is largely contaminated with nitrogen; but when coke is made from moderately bituminous coal in a by-products oven, the gas produced is practically equivalent to a somewhat poor coal-gas or to a rich fuel-gas. It is understood that the manufacture of this by-products coke-gas is likely to be undertaken on a large scale in Massachusetts and at Pittsburg, where the supply of natural gas shows symptoms of exhaustion.

The illuminating power depends on the 'heavy hydrocarbons;' of these benzol is the most effective (3 parts of it being equal to 25 of ethylene), and in ordinary English gas is present to the amount of from 5 to 10 grains per cubic foot, while ethylene and propylene are together from four to twelve times that quantity. If carbonic acid, sulphuretted hydrogen, and nitrogen be absent, the heavier gas is generally the richer, though a high percentage of carbonic oxide may also make a gas heavy. The specific gravity of coal-gas is from 0·4 to 0·55 (air = 1·00). There are two rough tests for the value of gas: (1) its durability—i.e. the time taken to burn 1 cubic foot of gas in a jet of 5 inches high; this ranges from 50′ 40″ for English caking-coal gas, to 84′ 22″ for Boghead gas; (2) the percentage of volume which is condensed by chlorine or bromine, which attack the heavy hydrocarbons. If any carbonic acid remain in the gas, it will diminish the illuminating power about one candle for every 1 per cent. of carbonic acid. If gas be mixed with air the illuminating power rapidly falls off: with 1 per cent. of air, the loss of lighting-power is 6 per cent.; with 2, 11; 3, 18; 4, 26; 5, 33; 10, 67; 20, 93 per cent.; 45, total loss of lighting-power. Ordinary gas mixed with more than 4 and less than 12 times its bulk of air is explosive; most so when mixed with 8 volumes of air or somewhat more (up to 11 volumes) if the gas be richer. Alone, it is not explosive. For ascertaining the illuminating power, the Bunsen photometer (the open 60-inch Bunsen-Letheby photometer, or the enclosed 100-inch Evans photometer) is generally employed. In this, at one

end of a rod, there is a candle; at the other end there is a gas-burner, and a meter to measure the supply of gas; the gas-burner and the candle are thus at a fixed distance from one another. Between them there moves, sliding on a graduated bar, a disc of prepared paper; this is slipped up and down until its two sides (or rather the images of its respective sides in two little mirrors which travel with it) appear equally illuminated. This is ascertained by the disappearance of a grease spot or rather, in the newer models, by the vanishing of all difference in appearance between an ungreased centre and the greased rim of the disc. In the Leeson disc there are three thicknesses of paper, of which the middle one is much the thickest, but is perforated at its centre; and this form of disc works better in the comparison of light of somewhat different colours. The Lummel-Brodhun photometer is an idealised Bunsen photometer, in which the place of the paper with its central grease-spot is taken by a purely optical arrangement of totally reflecting or partially reflecting prisms. The bar may be graduated in one of two ways: (1) Equal intervals, so that the respective distances between the disc and the gas-burner and candle may be measured; then the ratio between the intensities is the inverse ratio of the *squares* of the respective distances; say, for example, that the respective distances of the candle and gas-burner are 20 inches and 80 inches; then the gas-burner's intensity : the candle's $: : (\frac{1}{20})^2 : (\frac{1}{80})^2$ i.e. $: : 16 : 1$. (2) The bar may be so graduated as to anticipate and save this calculation, on which principle the mid-point of the bar would be marked 1, and a point one-fifth of the bar's length from either end would be marked 16; the figures so marked show directly the ratios sought for. The pressure of gas must be measured by a gauge and regulated by a governor; the consumpt of the candle must be weighed; the gas used must be exactly 5 cubic feet per hour; the burner is a standard Sugg's London Argand No. 1 for common coal-gas, a standard Steatite Batswing burner for cannel gas; the candles are sperm candles, of six to the pound, each burning 120 grains per hour; and the quantity of gas used is to be corrected for temperature and barometric pressure. The candle is a very unsatisfactory unit of light; it varies as much as 6 per cent., and its colour is not the same as that of the gas-flame. Other standards have been proposed; of these the principal are the German standard candle—1·065 English sperm candle; the French Carcel lamp (648 grains colza-oil per hour) = 10·441 English sperm candles; Mr Vernon Harcourt's pentane lamp, air + pentane-vapour, ½ cubic foot per hour, nearly equal to the English standard candle; Mr Methven's and Mr Fiddes's standard, in principal a given area of the bright part of gas-flame, this being, singularly, an almost uniform standard of illumination, not with any kind of illuminating gas, as was at first believed, but quite accurately so with pentane-vapour; Hefner-Alteneck's amyl-acetate lamp, with the flame turned up to a height of 1·6 inch, equal to 0·877 English standard candle; and the Dutch ether-benzol standard (1893) = 1·48 English standard candle. Other photometers (Elster's, with movable standard light, &c.) have been proposed. Lowe and Sugg's jet-photometer depends on this, that assuming the height of the flame to be kept constant, the lighting-power of a jet is inversely proportional to the consumpt—or otherwise, that the consumpt being kept constant, the height of the jet-flame is directly proportional to the lighting-power. In Giroud's jet-photometer the height of the flame at constant pressure is taken as the measure of illuminating power; when the flame is about 6 inches high, a variation of about ½ inch corresponds to a variation of one candle power, when the whole lighting-power is from 10 to 14 candles per 5 cubic feet. A Committee appointed by the Board of Trade in 1891, reported in 1895 that a flame of some kind must be used as the standard; that the sperm candle is unsatisfactory; that Mr Vernon Harcourt's pentane-vapour and air-flame is constant in brightness and easily reproducible when used as directed, and that it is accurately equal to an average standard candle; and that this should be made the basis of comparison, and called a candle; that for actual work with gas-flames it is better to compare these with more powerful sources of light than a candle, and that for this purpose a Dibdin 10-candle standard (an air and pentane-vapour Argand flame with a Methven screen) should be used, with the Methven screen fixed so as to expose 2·15 inches of the flame. They also recommend that instead of burning gas at 5 cubic feet per hour, the gas should be burned at just such a rate as will give the required number of candles, and that the illuminating power be calculated back, and be stated as so many candles per 5 cubic feet. Photometrically the lime-purified gas of the south of England is greatly inferior to the iron-oxide purified gas of the north of England, and yet an impression of greater brightness is often experienced, for the flame is white instead of yellow.

Gas-work apparatus falls under thirteen heads.—The *Retort-house* contains the *benches* or sets of retorts in which the coal is distilled. The retorts were formerly small, and of cast-iron only; they are now generally larger and of fireclay; though the use of iron is again becoming familiar in cases where the last retort or two of a set are more easily heated if made of iron than when made of fireclay. Retorts are made round, oval, and D-shaped; the first of these is the strongest and most durable; the oval and the D-shaped are better carbonisers. Clay retorts are usually 2½ to 3 inches thick, oval, with diameters 15 and 21 inches inside, and 9 feet 4 inches long; but 'through' retorts are often used, corresponding to two ordinary retorts joined together so as to form one tube, some 20 feet long, with a mouthpiece at each end—a form which is more readily manipulated and more readily kept clear of coke-deposit. Even these diameters are somewhat too great, and the result is better with narrower retorts; and in small works smaller and shorter retorts are generally used. Of late years through-retorts, inclined at an angle of some 30°, have come greatly into use, especially in conjunction with mechanical appliances for charging and discharging the retorts: the coal slides down the retort from a hopper and is promptly spread out into a layer of uniform thickness, and the spent coke is easily drawn from the retort in a stream. To an increasing extent the coal is first raised to a height and then lowered in the successive operations to successively lower levels, so that manual labour is economised. The Dinsmore retorts are Z-shaped, and the tarry products are subjected to continued distillation in the upper bends. Mr Isaac Carr's modification of this process has been very successful in his own hands at Widnes; but it seems that the process has not been successful elsewhere. Five or seven retorts, and sometimes ten or more are built into each oven; and all the retorts of one oven are heated from the same source. This may be a coke furnace, in which case some 3¾ cwt. of coke are used in distilling each ton of coal—i.e. about 25 per cent. of the coke made—a proportion which sinks in large works to 20 or 18 per cent.—or tar may be used as fuel, either dropped on hot plates or blown in by air or by steam as spray; or generator furnaces may be employed in which the fuel is first half-burned (CO being formed), and the hot furnace gases thus produced are burned under the retorts; or regenerative furnaces, in which the

same thing is done, but the air which meets the furnace gases under the retorts is heated by the waste heat, which would otherwise have been allowed to escape through the flue after the retorts had been heated; the result being a great economy in fuel and in the wear of the retorts. The retorts, once heated up, are kept continuously at an orange-red heat (2000° F.); they are charged with coal (2½ to 3 cwt. each); the charge is raked out after four or six hours, and a fresh charge is put in; the charging and drawing being now often done by machinery. The duration of clay retorts depends on the treatment they receive; fifteen to eighteen months where directly exposed to the fire, or, where protected, three or four years, or even longer. In the Yeadon and Adgie revolving retort, small coal is fed in at one end and coke dust withdrawn at the other as the retort revolves; each granule of coal takes about 15 minutes to traverse the retort. Every retort is provided with a mouthpiece, through which the charge is put in and extracted, and the door of which is pressed home by a screw or lever and may or may not be secured by cement. The gas produced passes from the retort by means of a wide vertical *ascending pipe*, a very short horizontal *bridge pipe*, and a short descending *dip-pipe*, which dips to a very slight extent below the overflow level of liquid in the *hydraulic main*. This hydraulic main is a wide tubular closed reservoir of wrought-iron, placed above the retorts; it has a large descending overflow-pipe; it is first filled with tar-water as far as it can be filled; the products of distillation from the retort pass through the hydraulic main; some tar is deposited, some watery liquid condensed; tar accumulates up to the overflow level, so that the gas passing through is washed in hot tar, and the light-giving constituents tend to become dissolved out to a large extent by the tar, unless the tar be kept sufficiently hot or be often enough removed from the hydraulic main. Down the overflow-pipe run the products of distillation, which sink into a *tar-well*, from which they are pumped out from time to time. This tar-well is also used as a general receptacle for condensation products deposited by the gas in its further course. The gas does not escape by this tar-well, for the overflow-pipe dips to an adequate depth into the liquid in the well; it passes on by a lateral horizontal tube. This device is repeated as often as is necessary.

The gas goes on to undergo a gradual process of cooling (to a temperature not below 55° F.) and farther condensation, partly in pipes led round the retort-house (in which the tar is largely deposited by friction while the gas is still hot), partly in the *condenser*. There are several types of condenser: (*a*) a series of vertical iron tubes in which the gas alternately ascends and descends, the cooling being due to the exterior air or to the trickling of water down the surface of the tubes; (*b*) vertical iron tubes of large size, concentrically arranged in pairs, so that the gas may slowly descend in the annular space between each two tubes, while the cooling air ascends the inner tube—the gas is then led up to the top of another annular space, and so on (Kirkham's); (*c*) a horizontal spiral; (*d*) a vertical zig-zag of pipes horizontally-laid; (*e*) arrangements for retarding the speed and thus enabling the gas, in comparative repose, more readily to deposit any particles; battery condenser; Mohr's condenser, in which the gas is guided through hollow cones, so as to run slowly. The cooled gas is then led to the *washer*, in which it is passed in fine streams through water, which dissolves ammonia, &c.; but here or farther on, after the scrubber, there is a suction arrangement, either a fan, a pump, or a steam-jet injector, called the *exhauster*. The coal being thus distilled in a partial vacuum, gas is more readily given off by it; and the gas once formed is rapidly removed from the retort and from the decomposing influence of the hot retort-walls, and its percentage in hydrocarbons is thus kept as high as may be; but there is at the same time a contrary tendency towards deterioration of quality, along with increase of yield, when the exhaust is at work. After the washer comes the *scrubber*, in which the gas is made to ascend a lofty column filled with coke or deal boards, down which water trickles, or is made to ascend a space filled with descending spray. Sometimes the gas is made, as in Pelouze and Audouin's so-called condenser, to deposit the last traces of tar by impact against solid surfaces; or may be made to run with or against a stream of hot tar, and thus to pick up hydrocarbons from the tar. Sometimes the functions of washer and scrubber are combined in one apparatus; sometimes a scrubber is used alone. The gas next passes through the *purifiers*, in which it has to pass slowly up, or better down, through an ample extent of thick layers of porous lime, or of iron oxide somewhat moist and rendered porous by sawdust, chaff, or other vehicle, or aided by porous magnesia, or through both, or else through washed Weldon slime. The gas ought, before this stage, to be free from all impurities, except carbonic acid, sulphuretted hydrogen, and bisulphide of carbon, and these are removed in the purifiers. There are various devices for absorbing these by means of ammonia and hydrocarbons separated in the earlier stages (Young, Claus, Hills). The British parliamentary standard of purity is that 10 cubic feet of gas shall not stain lead paper (absence of sulphuretted hydrogen); that the ammonia in the gas shall not exceed four grains per 100 cubic feet; and that the whole sulphur in the gas shall not exceed twenty-two grains per 100 cubic feet. The purifiers are so arranged that while a sufficient large area of purifying material shall always be encountered by the gas, one part of the purifiers after another is thrown out of action, and renewal of the material is thus possible, when required, without interruption to the purification. The *valves and connecting pipes* are so arranged as to permit this alternation to be readily effected: and throughout a gas-work, the pipes are so arranged as to permit any single piece of apparatus to be cut out of the gas-stream when required.

The gas goes on from the purifiers to the *station-meter-house*, in which there are (*a*) the station-meter, a large 'wet' meter for measuring the whole make of purified gas; (*b*) the exhaust, previously referred to; (*c*) pressure gauges, and (*d*) pressure-recording instruments; (*e*) the station-governor, by adjustment of which the pressure of gas as supplied from the gasholder to the mains is to be regulated. From the station-meter the gas goes on to the *gasholder*, or holders, to be stored and issued as required. The gasholder is an inverted cylindrical vessel of sheet-iron, placed in a tank of stone, brick, concrete, cast or wrought iron, steel, or a combination of these, but generally of brick or stone, lined with Portland cement, or backed with clay puddle, and, where possible, sunk into the ground. The tank contains water, in which the cylindrical vessel floats and rises or sinks. As the floating holder rises and sinks, it is kept vertical by tall columns which surround it, and guide its motion. On the tops of these columns are pulleys, over which run chains which at one end are connected to the crown of the gasholder, while at the other they bear suspended balance-weights. These balance-weights are not quite heavy enough to balance the weight of the floating vessel, which

thus tends to descend and press the gas (contained between the water and the crown of the holder) out into the mains, and also back through the station-meter; but they so nearly poise the floating holder that the small pressure at which the gas is delivered through the station-meter is sufficient to lift the holder, and thus to enable gas to accumulate in it when there is no outflow through the main; and when there is such an outflow, the gas-holder oscillates up and down according to the proportion between the gas taken off from the mains and that supplied from the retorts. When the diameter of a gasholder is proportionately great, it does not need counterbalancing. It is comparatively not a heavy structure, and it contains a gas which is lighter than air, so that the pressure upon the base, so far as due to the sheet-iron holder and its contents, readily comes to be but little more than that which would have been due to an equivalent quantity of air. Mechanical ingenuity has been spent upon framing the holder by means of ribs, and internal bars, so as to give the maximum strength (freedom from buckling) with the least weight; and upon the construction of telescopic holders, in which the holder is constructed in two, three, or four lifts or cylinders, of which only the inner one has a crown. In each pair of cylinders the inner one has its lower free edge turned up, so that when it rises it hooks into the down-turned upper free edge of the outer cylinder, and, as the gasholder goes on filling, lifts the outer cylinder from the tank, and so, if there be more than two lifts, for each succeeding cylinder; the gas being prevented from escaping between any two of these mobile cylinders by the water which the inner one lifts from the tank in its upturned edge. Recently the construction of the gasometer has been managed in such a way as to dispense with the columnar guides. Necessarily the space within the gasholder above the tank water is, by means of pipes, placed in communication both with the station-meter and the mains. The function of the gasholders is a most important one; they act as a reservoir, and usually are of a capacity sufficient to contain a twenty-four hours maximum supply (the quantity used on a midwinter day); and they also equalise the pressure. The gasholder of the South Metropolitan Co. at East Greenwich has six lifts, a diameter of 300 feet, a height when inflated of 180 feet, and a capacity of 12,000,000 cubic feet. The gasholder ensures a regular supply at all hours both of day and night; and by its means a comparatively small plant, kept continuously working, is enabled to meet demands for which, if the gas were supplied direct from the retorts, it would be quite inadequate.

Before reaching the mains the pressure of the gas is regulated by the *station-governor;* an excessive pressure in the mains would result in excessive leakage. There are various devices for securing the automatic adjustment of resistance, whose amount is made to increase or diminish with the pressure; either by the gas lifting to a greater or less degree the floating bell of a small gasholder, and thereby altering the position of a conical or parabolic plug suspended within the entrance to the main, or (Hunt's) by working a throttle-valve.

The gas is conveyed from the works by main-pipes or *mains*, generally of cast-iron, carefully jointed; the jointing is effected either by turning and boring so as to make the pipes fit easily with a little white and red lead, or by using pipes which do not exactly fit, and making them do so by means of caulking, melted lead, india-rubber, or rust cement; in some cases the pipes are connected by ball-and-socket joints; in others, special provision is made for expansion. At each lowest point provision is made for taking off water, as by a trapped drip-well, the liquid in which can be pumped out into a cart and taken to the gas-works. When mains supply a district the altitudes in which vary considerably, the tendency is for the local pressures to vary correspondingly; a difference of 100 feet in level makes a difference of 1·5 inch of water in a pressure-gauge; and therefore it is necessary to use district-governors which control the pressure in particular districts. To the mains are connected branch or *service pipes*, usually of wrought-iron or lead, in which the deposition of moisture is provided for, either by making the whole service-pipe drain into the main, or by fitting up a drip-well at each lowest point.

The gas supplied is measured by meters, of which there are two main varieties, the wet and the dry. The wet meter is a device for measuring out successive units of volume of gas; the reading will be the same whether the gas be delivered at low or at high pressures; and therefore the lower the pressure the less the absolute quantity of material in gas measured through a wet meter, and *vice versâ*. In a wet meter there is a cylinder mounted on an axis; this cylinder is hollow, the hollow being divided into four parts or chambers by partitions, the longitudinal boundaries of which present the form of an Archimedean screw or the rifling of a gun; the gas enters one of these spiral chambers at one end; as the gas is pressed in, it displaces water and makes the hollow space lighter than water; it thus makes the hollow tend to rise, and in that way works the cylinder partly round. No gas can pass through the chamber until it is completely full. When one chamber has been completely filled, two things happen: the entering stream of gas now finds an inlet into the succeeding chamber; and, secondly, the gas in the first chamber finds a possible outlet at its opposite end, through a slit which now begins to emerge above water-level. As the cylinder goes on rotating, the first chamber comes to sink under water; water enters the chamber and gas leaves it; and so for each of the four chambers in succession. The axle, thus made to rotate in proportion to the amount of gas delivered, works a train of wheelwork which by means of pointers shows the number of 10,000's, the number of 1000's, and the number of 100's of cubic feet of gas which have passed through the cylinder. The water must be kept at a constant level; it may freeze, for which reason the meter should be kept in a sufficiently warm place (not too warm, else the gas will expand and the meter give too high a reading), or else a non-freezing liquid should be used; and the water damps the gas. There are contrivances for maintaining the water-level constant; the meter sometimes shuts off the gas when the water is too low. Thus there may be an automatic addition of water from a subsidiary reservoir, or an automatic maintenance of level by a hinged float which sinks into the water when liquid fails to support it in its uppermost position (as in the constant-level inkstands); or, there may be (Warner and Cowan) a contrivance for transferring the excess of gas delivered at each revolution, when the water is too low, back again for measurement. When the meter is driven too fast the record is too low; but backwash in the meter then causes flickering at the jet; and the general use of meters too small for the work which they have to do is conducive to leakage in the district within which they abound, on account of the high pressure necessary to force gas through them.

Dry meters are, in principle, a variety of piston-meter; the fluid is measured by displacing a piston or diaphragm, and thereby filling a measured cavity. They consist of two or three separate

chambers; each chamber is divided into two by a diaphragm, which may be displaced to one side or the other. The gas is admitted to the one side of this diaphragm until it is displaced to the full extent of its range; when this occurs the gas is admitted to its other side, and the gas previously admitted is allowed to go on to the burner, and so on alternately. The chambers act alternately, thus passing the dead-points. The diaphragms are connected with wheelwork which record their successive oscillations, and represent on the dials the corresponding number of cubic feet passed through the apparatus. By an act of parliament (1859) all gas-meters must register not more than 2 per cent. in favour of the seller and not more than 3 per cent. in favour of the purchaser of gas; and meters must bear the seal of an inspector appointed under the act. Meters have recently been introduced which enable the poorer consumer to purchase gas by pennyworths on the familiar 'penny in a slot' principle ('coin' meters), or to pay into the meter a definite sum which will allow the mechanism to transmit the prearranged quantity of gas ('stop' meters). In Brussels the gas burned by day and that used at night were for some years registered on different dials of the same meter.

The lighting power of a gas is measured in terms of the number of candles to which a 5-feet standard flat-flame is equivalent. The lighting value of a gas is measured by the number of candle-hours it will yield per 1000 cubic feet when burned in standard burners; thus 1000 cubic feet of 20-candle gas will keep up a light of 20 candles for 200 hours (using 5 cubic feet per hour), and its lighting value is 4000 candle-hours, or, as it is generally abbreviated, 4000 'candles.' Since a standard candle shines for one hour at the expense of 120 grains of sperm consumed, the lighting value of a gas is frequently stated as so many grains of sperm; thus the 'sperm value' of 20-candle gas is $20 \times 200 \times 120 = 48{,}000$ grains per 1000 cubic feet. During recent years cannel coal has become too expensive to make gas from, and the use of cannel gas has been given up in the limited region of the west end of London to which it was formerly supplied. Gas-makers have, therefore, had to reduce their standard, as in Edinburgh, where the 28-candle gas has been replaced by 24-candle gas, or else to turn their attention to the *enrichment* of a poorer gas made from ordinary coal. This enrichment is effected by the addition of hydrocarbon vapours in various forms to the poorer coal gas. If gas of higher quality be made by a more costly process, so that it costs say d^1 pence per 1000 cubic feet to make gas of a lighting power C^1, instead of d pence to make gas of a lighting power C, the cost per additional candle of lighting power is $\{(d^1 - d) \div (C^1 - C)\}$ pence per 1000 cubic feet of gas made. If the enriching gas be added in the proportion of f cubic feet to 1000 of coal-gas, of a lighting value of C candle-hours per 5 cubic feet, then if the resulting $(1000 + f)$ cubic feet of enriched gas have a lighting value of C^1 candle-hours per 5 cubic feet, and if the original gas and the added enriching gas respectively cost d and d^1 pence per 1000 cubic feet, the additional cost per 1000 cubic feet of gas made is $\{f \times d^1 + d \times [1000 - f \times (C^1 - C)]\}$ pence per additional candle of lighting power. If we add a richer gas to a poorer, the lighting power of the mixture is generally not equal to the arithmetical mean as deduced by calculation; there is generally deterioration due to dilution; but it often happens that if we add a little poor gas to an exceedingly rich one the lighting power is higher than we would have expected. But if we apply to the actual results of enrichment the same methods which we would use if there had been no deterioration, we obtain a useful nominal value for the lighting power of the richer gas, which is called its 'enrichment value.' Thus if we mix 13⅓ cubic feet of oil-gas, of an unknown enrichment value C^{11}, with 1000 cubic feet of 14-candle coal-gas, and obtain 1013⅓ cubic feet of 15-candle gas, we find, from the equation $1013\frac{1}{3} \times 15 = 1000 \times 14 + 13\frac{1}{3} C^{11}$, that $C^{11} = 90$ candles, the nominal lighting power of the enriching gas, or its enrichment value. As means of enrichment by mere admixture, we have benzol-vapour, which is much used on the Continent, and which for small enrichment adds about 4700 candle-hours per gallon of benzol evaporated into the gas; carburine or light petroleum oil (practically hexane, C_6H_{14}), used to some extent in London under the Maxim patents, and adding about 1600 candle-hours per gallon evaporated; and oil-gas. Oil has also been employed as spray injected into the coal-retorts themselves; and coal-gas is largely carburetted by being exposed, along with the vapours obtained by the distillation of oil, to a high temperature, so that these vapours may be rendered more 'permanent,' or less liable to condense in transit through the pipes.

It is of great importance that in the first place gasfittings should be adequate to supply the maximum demand for gas; and in the second, that the gas should emerge from each burner under a low pressure. If the gasfittings—pipes, &c.—be inadequate, as they mostly are, full flames cannot be produced, and the light is unsatisfactory; if, on the other hand, the full pressure of the mains is communicated too directly to the gas-burners themselves, there is a tendency to flare. This can be mitigated by partially turning off at the meter; but even then the variable demand may result in variable pressures at the burners. There should be a governor for each gas-burner, or for each small group of gas-burners; these are now readily procurable, and when they are used a full flame is obtained which is constantly and steadily kept up by a comparatively slow supply of gas; the incandescent particles or heavy heated hydrocarbon vapours upon which luminosity depends are allowed to remain as long as possible in the flame, and the gas is thoroughly burned; and air is not swirled into the interior of the flame by the swift current of gas, thus spoiling the luminosity. An ordinary burner gives greatly superior results when governed; since the electric light has caused more attention to be paid to the efficient burning of gas, the burners themselves have been greatly improved; but burners should always be selected with reference to the quality of gas to be used in them.

The ordinary ratstail burner has long given place to the batswing and fishtail burners, the former of which are made with a clean slit across the head of the burner; the latter have two passages converging towards one another, the result being that the two streams of gas meet one another and spread out into a flat sheet of flame. The former use much gas at ordinary pressures, and a very small pressure (⅛-inch of water just below the burner) is sufficient to bring out the full lighting-power. In hollow-top burners the pressure is relieved by the gas swirling in a cavity below the outlet-slit. Burners of these classes should always be selected with steatite tops; metal burners soon rust and spoil the flame. In Argand burners the gas issues through a ring of holes; the flame is tubular, and is surrounded by a chimney; air ascends both inside and outside the tubular flame. In Dumas burners the circle of holes is replaced by a circular slit, and a regulator controls the admission of air. These various burners have also been collected in groups to form the so-called sunlights,

and so forth; but the recent remarkable progress in gas lighting has been due to the study of the mutual actions of flames, and to the use of hot air and sometimes hot gas. For example, we have concentric Argand flames (Sugg); porcelain cylinders in the axis of an Argand flame to keep the flame from flickering, to keep up the heat of the flame, and also themselves to radiate light when incandescent; burners in which gas from a circular slit plays on the under surface of a porcelain globe; and especially regenerative burners of various models, generally with inverted flames, in which the heated products of combustion are made to heat the incoming air. Globes and shades cut off a good deal of light; a clear glass globe cuts off from 9 to 12 per cent.; ground glass about 40; opal globes about 60. Globes should never have a lower aperture narrower than 4 or 5 inches; the ordinary narrow aperture makes a strong draught of air, which materially weakens the brightness of the flame, and unsteadies it. For use with incandescent mantles globes are now made with surfaces mathematically facetted ('holophanes') or channelled ('diffusers') which distribute the incident light and spread out the light so as to make it apparently fill the globe.

Sometimes gas is burned with air in a small Bunsen burner, and over the flame is fitted a basket of platinum wire (Lewis), or a small mantle consisting of thoria along with a little ceria (Auer von Welsbach), which emits a brilliant white light on incandescence; or the ordinary flame of gas may be rendered more luminous by passing the gas over melted naphthaline, which it takes up (Albo-carbon). In Denayrouze's modification of the Bunsen burner, the gas and air are effectively mixed by means of a little fan-wheel driven by a minute electromotor; the flame is altered in character and becomes intensely hot; if a Welsbach mantle be used with such a burner, the lighting effect goes up as high as 270 candles with a consumpt of 9 cubic feet of London gas per hour. In Bandsept's Bunsen burner, the gas and air are similarly mixed by means of a baffler immediately under the flame; the result is about ⅔ the light given by a Denayrouze.

For heating purposes, coal-gas mixed with air produces a smokeless flame and a higher temperature than it does when burned in luminous flames; and so for direct heating the Bunsen Burner (q.v.) principle is suitable. In one modification of the Bandsept Bunsen burner the air is driven through an inverted injector under high pressure, dragging gas with it, and being mixed therewith; and the flame is produced under the surface of any liquid which it may be desired to heat up. Thus about 90 per cent. of the heat evolved is utilised directly. Gas produces the same quantity of heat, provided that it is completely burned, in whatever way it is burned. Convenience, cleanliness, may often determine the use of Bunsen flames; but where radiation is expected to come into play the luminous flame is more effective—as for cooking (see WARMING). Coal-gas for cooking is economical, as it can be turned off when not wanted, and turned on at once; and it is smokeless if properly burned. Of course it ought not to be left unprovided with a chimney. For ventilation, a well-arranged system of lamps, especially of the regenerative type, will provide motive power for carrying away their own products of combustion and for renewing the air of the room. Gas is largely used for gas-engines (q.v.), which in 1896 were being made up to 1000 horse-power.

The price of light obtained from coal-gas may be ascertained by finding the cost of a *candle hour*—the light of one standard sperm candle for one hour—in each case. The table combines the data of Stevenson Macadam, Letheby, Thompson, Poris, and others, and gives the price per candle-hour, in thousandths of a penny:

Edinburgh gas: 24 candle-power, in a 5-feet burner (No. 5); lighting effect 24 candles; price of gas 3s. per thousand cubic feet	7·5
Do. in a 4-feet burner (No. 4); lighting effect 17·8 candles	8·0
Do. 3-feet burner (No. 3); 11·8 candles	5·6
Do. 2 " (No. 2); 6·9 "	10·4
Do. 1 " (No. 1); 2·6 "	14·0
Do. ½ " (No. ½); 0·85 "	21·0
Do. with a Welsbach incandescent mantle, in a 3½-feet burner (1-inch pressure); average effect, 48 candles; mantle 1s. 6d., lasting 1000 hours	3·125
Gas at say 2s. 9d. for 16-candle gas; burned in Argands	7·7
Do. in Siemens' precision Argand burner	7·8
Do. " Inverted Siemens, Buschke and Wenham	2·6 5·3
Do. burned in Welsbach mantle as above	2·99
Do. " " with Bandsept burner	2·04
Do. " " with Denayrouze burner, 9 cubic feet, 270 candle-power	1·52
Sperm oil, at 2s. per gallon, in Argands	8·7 27·5
" " in common lamps	55·0
Paraffin, at 8d. per gallon, in modern lamps	5·3 8·9
Tallow candles, at 6d. per lb.	110
Composite candles, at 8d.	10·1
Paraffin candles, at 5d.	62·5
Wax candles, at 2s.	404
Electricity in arc lamps, 875 candle-power, consuming 500 watts per hour, at 5d. per 1000 watts	2·96
Electricity in glow lamps, 16 candle-power each, consuming 56 watts per hour, at 5d. per 1000 watts; lamp 1s., lasting 1000 hours	17·85

The price of gas, like the quality, will vary from place to place, owing to differences in the price of coal, the cost of the works, and so forth. In the London Gas-light and Coke Company's accounts we find the gross cost of manufacture of each 1000 cubic feet of gas sold is 23·418 pence; the residuals—coke, breeze, tar, and ammoniacal liquor—return 9·036d.: so the net current cost at the works is 14·382d. for each 1000 cubic feet sold; the cost of distribution is 3·571d.; public lighting involves an outlay of 0·437d.; rates and taxes come to 2·696d.; management to 0·894d.; various charges (bad debts, annuities, legal expenses, &c.), come to 0·546d.—altogether 22·526d.: which meter and stove rents, &c., bring down to 22·144d. The average price of the gas sold is 33·705d.; the difference, 11·561d. per thousand on a sale of 9,453,889,000 cubic feet in six months, corresponds to a gross profit of just over 8⅛ per cent. per annum on the paid-up capital of £11,198,000. The capital value of the works of this company in January 1896 was £11,792,851, 9s. 11d.; that of the South Metropolitan Company was £3,405,715, 4s.; and that of the Commercial Company, £877,951, 10s. 9d.

The risks of gas-lighting are twofold—explosion and poisoning. Explosion cannot occur until there is about 6·6 per cent. of gas in the air, but it is dangerous to 'look for a leak with a light.' As to poisoning, the gas must escape into a room without being noticed until there is about one-half per cent. of carbonic oxide—i.e. from 4 to 12 per cent. of coal-gas—in the air of the room, before danger to life becomes imminent; and this percentage is rarely attained by ordinary escapes into rooms of fair size. Fatal accidents have generally happened from escapes into small rooms, and also from the travelling of gas from broken mains through earth into an earth-floored house, which may draw the earth-gases through it in a deodorised condition. A gas-escape is most likely to be serious in its consequences when it takes place into the upper part of a room; the percentage near the ceiling may then come to be much greater than it is at first lower down (see POISONS).

From 1639 onwards the attention of scientific men had repeatedly been turned to 'burning springs' or streams of 'inflammable air' issuing from wells and mines in the coal districts of England, and communications on the subject were addressed to the Royal Society of London. Some time before 1691

the Rev. Dr John Clayton, Dean of Kildare, addressed a letter to the Hon. Robert Boyle, in which he described experiments on the production and storage of inflammable gas distilled from coal; and this letter was published in the Royal Society's Transactions for 1789. In 1787 Lord Dundonald made some domestic experiments on lighting by coal gas. In 1792 William Murdoch lit up his house and office at Redruth in Cornwall; in 1798 he lit up a part of Boulton & Watt's manufactory at Soho Birmingham; and in 1805, with 1000 burners, the mills of Messrs Philips and Lee at Salford. In 1801 Le Bon lit his house with coal-gas, and in 1802 he proposed to light a part of the city of Paris. In 1803 Wintzer or Winsor lectured in London upon the new light; he was a sanguine projector, holding forth fantastic hopes, but was instrumental in founding the Chartered Gas Company which obtained its Act of Parliament in 1810. In 1813 he was replaced by Mr Samuel Clegg, who had been managing Boulton and Watt's gas lighting since 1805 in succession to Mr Murdoch, and who was the inventor of the hydraulic main, the wet meter, and the wet-lime purifier. In 1813 Westminster Bridge was lighted by gas, and immediately thereafter the new method of lighting made very rapid progress in Great Britain and other countries; and in the contest for supremacy between coal-gas and oil, wood, and peat-gas, which were at one time somewhat extensively tried, coal-gas took the lead.

II. *Oil-gas* is prepared from heavy mineral oils (sq. gr. = 0·9) or paraffins, from their residues, and sometimes from spent grease, suint, waste mutton fat (in Australia), &c. One hundred lb. of oil yields from 722 to 1092 cubic feet of gas, of which *one* cubic foot per hour yields a light of 10 to 12 candles. The oil is made to flow in a thin steady stream into cast-iron retorts, heated to between 900° and 1000° C.: these retorts are horizontal or vertical, or are in some cases so arranged that gas formed in one retort or section of a retort is further heated in another retort or in another section of the same retort. The condensation requires special attention; oil-gas has a tendency to carry non-permanent vapours with it, and these must be removed. The purification necessitates the use of scrubbers, purifiers, and so on as in coal-gas. Even in refined paraffin and petroleum oils there is sulphur present often far in excess of that contained in an equivalent quantity of coal-gas. Oil-gas must be burned at a low pressure and in small burners; the standard burner is No. 1 (1 cubic foot per hour). Oil-gas is used for lighting railway carriages; the gas, carefully purified, is compressed at 10 atmospheres' pressure; it is then transferred to the reservoirs borne by the railway carriage, each of which carries, at 6 atmospheres' pressure, enough gas for 33 to 40 hours' lighting; a regulator governs the pressure at the burners, and each burner, consuming 0·777 cubic feet per hour, gives 7 candle-light. Compressed oil-gas has also been applied to the lighting of buoys, and to some extent to steamship lighting. In the Young & Bell process, oil is made to trickle from cooler to hotter regions, but at no point is the temperature relatively very high; as the oil descends, any given constituent of it meets a temperature competent partly to decompose it into lighter and heavier hydrocarbon gases and vapours: the gaseous and vaporous mixture produced travels upwards and meets the down-flowing stream; this stream dissolves everything except the lightest gases and vapours, which pass off as oil-gas, without being subjected to any excessive temperature, while the materials dissolved find their way back towards the retort, and are again subjected to heat and further decomposition. The only by-product is a very pure form of coke. This gas has an enrichment value of about 90, and may be applied to the enrichment either of ordinary coal-gas or to that of poor gas or water gas. Mr Tatham mixes oil-gas with about 15 per cent. of oxygen, and thereby enables the gas to be burned directly in greater volume with ordinary small burners, so that a lighting power is attained equivalent to 100 candles per 5 cubic feet. The light is brilliantly white, and the flames are not so small that they are chilled by the burner itself.

III. *Peat-gas* and IV. *Wood-gas* are occasionally used. Wood-gas is a by-product in the preparation of pyroligneous (crude acetic) acid; its lighting-power is about 20 candles; the yield is 546 to 642 cubic feet per 1000 lb. of wood; of the crude gas 20 to 25 per cent. consist of carbonic acid. Peat yields 320 to 500 cubic feet of gas per 100 lb.: lighting-power about 18 candles; the carbonic acid in the crude gas is about 30 per cent.

V. *Producer Gas.*—When a limited stream of air is driven through glowing coke, the coke is first burned to carbonic acid; the carbonic acid, as it travels through the remainder of the brightly glowing coke, takes up carbon and, for the most part, becomes carbonic oxide; the resultant gaseous mixture consists of carbonic oxide (about 26 per cent.), the nitrogen of the air employed (about 70 per cent.), and some undecomposed carbonic acid (about 4 per cent.). This mixture is combustible with a clean flame, and this kind of fuel is now largely employed (generally with utilisation of the waste heat to warm the incoming current of air, as in the so-called regenerative furnaces) for heating the retorts in coal-gas-making, in metallurgical operations, in glass and pottery making, and in boiler firing. The furnace hearth becomes a clear, clean, deoxidising region of intense heat without visible flame. The gas from the producer is very hot; if it be passed at once into the furnace, a large proportion of the heat of the coke may be utilised; if it be allowed to cool, a considerable percentage is lost. The usual yield of producer gas is from coal (Siemens) about 160,000, from coke about 175,000 cubic feet per ton; the heating values are, for cooled gas, respectively 29,700 and 26,900 calories per thousand cubic feet, or altogether 60 and 68 per cent. of those of the respective materials employed.

VI. *Producer Water-gas.*—When mixed air and steam are driven through glowing coke (or anthracite, Dowson), the air keeps the coke glowing, and, as in the previous case, produces carbonic oxide, carbonic acid, and nitrogen; the steam acts on the glowing coke and produces hydrogen and carbonic oxide; the result is a mixture whose composition varies according to the relative quantities of air and steam, and according to the temperature in the producer; as an average it may be said to consist of 9 per cent. of carbonic acid, 24 of carbonic oxide, 13 of hydrogen, and 54 of nitrogen. If an excess of steam be used, there is more hydrogen, more carbonic acid, and less carbonic oxide. The usual yield is about 168,000 cubic feet per ton of material; the heating value is about 33,500 calories per 1000 cubic feet; altogether about 80 per cent. of that of the coke and anthracite employed.

VII. *Water-gas.*—In 1793 Lavoisier discovered that when steam, unmixed with air, is passed through glowing coke, the coke is oxidised; carbonic oxide and hydrogen gas are produced, theoretically, pure and in equal volumes; practically, the product contains 3 to 8 per cent. of carbonic acid, and 4 to 9 of nitrogen. The yield is from coke (7,000,000 calories per ton) about 35,000 cubic feet, with a heating value of about 75,000 calories per 1000 cubic feet, or on the whole about 40 per cent. of the heat-value of the coke; from coal (7,800,000 calories per ton) about 42,000 cubic feet, at 95,000 calories, or about 49 per cent. In the

process the steam cools down the glowing coke; consequently air must be sent through the coke at intervals (about 4 minutes steam and 10 minutes air) in order to restore its glow; and a series of producers must be so conjoined as to act alternately with one another, before the process can result in a continuous supply of water-gas. The by-product, producer gas, which may be produced in large quantities (110,000 cubic feet, at 26,900 calories per 1000) by regulating the supply of air while the coke-glow is being worked up, may be used for boilers or for gas-engines. When it is so utilised, the net cost of making simple water-gas is between 5d. and 6d. per 1000 cubic feet, about 8d. per 1000 less than coal-gas. Water-gas gives on combustion an extremely high temperature, which saves time in furnace work; gold, silver, and copper, and even an alloy of 70 parts of gold and 30 of platinum are readily melted in quantity by it; hence for bringing objects such as Fahnehjelm's combs (a series of rods of magnesia) into brilliant luminous incandescence, for welding, or for metallurgical operations involving high temperatures, it is very suitable; and in gas-engines it works cleanly. When water-gas is used with Fahnehjelm combs, the quantity of gas used is (Dr F. Fischer) 180 litres, or 6½ cubic feet per hour, the light being, when the burner is new, 22 to 24 candles, and after 60 hours, reduced to 16. The combs (15s. per hundred) require renewal after 100 hours' use. As a carrier of heat, coal-gas is twice as effective in respect of quantity of heat; its heating-power is about 150,000 calories per 1000 cubic feet, which represents about 20 per cent. of the whole heat of the coal distilled, or about 50 per cent. after allowing for the heating-power retained in the coke, breeze, and tar; and this concentration of heating-power in smaller bulk may in some cases transfer the advantage of cheapness, through smaller cost of distribution, to coal-gas. Water-gas is much used in the United States. It is supplied to houses, either pure or mixed with the coal-gas produced in the manufacture of the coke from which the water-gas is made, and it is then known as 'fuel gas;' but more generally it is carburetted by being exposed to a high temperature along with naphtha or petroleum vapours, and the resultant mixture is employed as illuminating gas. Unfortunately the high percentage of carbonic oxide, which is odourless, has caused a high death-roll.

VIII. *Acetylene.*—This gas, C_2H_2, long a chemical curiosity merely, is now prepared on the large scale by the action of water upon calcium carbide, which is made by exposing a mixture of lime and carbon to the temperature of the electric arc in the electric furnace. The carbon unites with the hydrogen of the water, forming acetylene; the calcium with the oxygen, forming lime, which, as slaked lime, remains in the water. This gas gives, with a half cubic-foot burner, an intensely white solid-looking flame of 24 candle-power. For enrichment its enrichment value is about 100 candles for about the first five candles of additional illuminating power; after which the effect of dilution wears off, and the enrichment value may go up to about 150. Sufficiently dilute pure acetylene is not appreciably poisonous; but it has a characteristic disagreeable odour, partly due, when it is made from carbide, to traces of phosphuretted hydrogen. A ton of carbide produces about 11,000 cubic feet of acetylene; and though estimates have been published which show a cost of £4 per ton, the manufacturers have not been able, in Europe, to put it on the market at less than 405s. a ton (1896).

IX. *Natural Gas* issues from the earth in many places—the eternal fires at Baku (q.v.), for example; from other gas-wells in the Caucasus, natural or opened in boring for oil; in China; but principally in North America. At Fredonia, New York state, gas escaping from the earth was used in 1821. In 1859 boring for oil in Pennsylvania and elsewhere became general; the gas associated with this was conveyed to a distance and burned as a nuisance. The general utilisation of the gas began in 1872 at Fairview, Butler County, Pennsylvania. Many of the gas-wells lasted only four or five years. In 1874 the gas was used in iron-smelting, and by 1884 one Pittsburg company used gas equivalent to the produce of 400 tons of coal a day. Pittsburg, formerly lying under a continuous black pall of smoke, became bright and clear. But now the supply has fallen off, and Pittsburg has been supplied with gas from West Virginia, at a distance of 102 miles (and see above at p. 98). Chicago is supplied with natural gas from Greentown, Ind., at a distance of 116 miles. Nearly all the gas obtained is now distributed by pipes and pumping engines, and in the United States of America about 400 million cubic feet per day are thus distributed. Natural gas is also found by boring elsewhere in Pennsylvania, in Ohio, Indiana, Kentucky, Illinois, Kansas, the Dakotas, and at Los Angeles in California. The North American gas consists mainly of marsh-gas; sometimes it contains nothing else than marsh-gas and a little carbonic acid; sometimes there are various percentages of hydrogen, ethylene, traces of carbonic oxide, nitrogen, oxygen, or heavy hydrocarbons. The Baku gas contains 3 per cent. of heavy hydrocarbons, and is more regularly deficient in hydrogen. The American gas is used for all metallurgical processes except the blast-furnace, and is very convenient for glass-making. In some places the gas is carburetted or used with Fahnehjelm's combs. Natural gas may possibly underlie the English salt-beds.

See King's work on coal-gas edited by Newbigging, whose *Gas Managers' Handbook* is also valuable; Wars-lyn's *Gas Engineers' Chemical Manual*, and Butterfield, *Gas Manufacture* (1896) for chemistry; Field's *Analysis*, and the *Gas World's* yearly analyses.

Gascoigne. SIR WILLIAM (1350–1419) judge, was appointed on the accession of Henry IV. a justice in the Court of Common Pleas, and in November 1400 was raised to be Chief-justice of the King's Bench. He was evidently a fearless judge, as he refused to obey the king's command to sentence to death Archbishop Scrope and Mowbray after the northern insurrection in 1405. Nine days after the death of Henry IV. a successor was appointed to his office, which disposes of the fiction that Henry V. continued him in it (Shakespeare's *Henry IV.*, V. ii. 102–121). The famous story of his encounter with the dissolute young prince Hal lacks historical support. Mr Croft and Mr Solly Flood believe it originated in the Rolls entry under Edward I., that the prince, afterwards Edward II., was expelled from the court for half a year, for insulting one of his father's ministers. The story as ascribed to Prince Hal first appears in Elyot (1531). Hall has the story also, and after him Holinshed, although none of the three, like Shakespeare, mentions the judge by name.

See Croft's edition of Elyot's *Boke named the Governour* (1880), and Church's *Henry V.* (1889).

Gascony (Lat. *Vasconia*), an ancient district in south-western France, situated between the Bay of Biscay, the river Garonne, and the Western Pyrenees. The total area is over 10,000 sq. m.; its inhabitants, numbering about a million, have preserved their dialect, customs, and individuality. The Gascon is little in stature and thin, but strong and lithe in frame: ambitious and enterprising, but passionate and given to boasting and exaggeration. Hence the name *Gasconade* has gone into literature as a synonym for harmless vapouring. The Gascons, moreover, are quick-witted, cheerful, and

persevering, and make capital soldiers. This is especially true of the Gascons in the Gers department; the peasants of the Landes, living in mud huts, are extremely ignorant and rude in their manners, but yet are honest and moral.

Gascony derived its name from the Basques or Vasques, who, driven by the Visigoths from their own territories on the southern slope of the Western Pyrenees, crossed to the northern side of that mountain-range in the middle of the 6th century, and settled in the former Roman district of *Novempopulana*. In 602, after an obstinate resistance, the Basques were forced to submit to the Franks. They now passed under the sovereignty of the dukes of Aquitania (q.v.), who for a time were independent of the crown, but were afterwards conquered by King Pepin, and later by Charlemagne. Subsequently Gascony became incorporated with Aquitaine, and shared its fortunes.

See Monlezun, *Histoire de la Gascogne* (6 v ls. Auch. 1846-50); Cénac Moncaut, *Littérature populaire de la Gascogne* (Paris, 1868); and J. F. Bladé, *Contes populaires de la Gascogne* (3 vols. Paris, 1886).

Gas-engine. Gas-engines are heat engines of a type in which the fuel is combustible gas, which is burned within the engine itself. In all heat-engines there is a working substance, which is alternately heated and cooled, and does work by alternate expansion and contraction of its volume, thereby converting into mechanical form a portion of the energy which is communicated to it as heat. In most heat-engines the combustion of the fuel which supplies heat to the working substance goes on outside of the vessels within which the working substance is contained: the steam-engine is a characteristic example of this class. Gas-engines, on the other hand, belong to the internal combustion class: the working substance is made up of the fuel itself—before and after combustion—along with a certain quantity of diluting air. Internal combustion engines have the enormous advantage that there is no heating surface of metal through which the heat must pass on its way to the working substance. The existence of a heating surface in the external combustion engine imposes practically a somewhat low limit upon the highest temperature to which the working substance may be raised. In gas-engines a far higher temperature is practicable, and the result is that it becomes possible to convert a larger fraction of the heat into work. The theory of Thermodynamics (q.v.) shows that even the most efficient conceivable heat-engine can convert into work no more than a certain fraction of the heat supplied to it—a fraction which is increased by increasing the range through which the temperature of the working substance is caused to vary. This range is much greater in the gas-engine than in the steam-engine, and the ideal efficiency—that is to say, the fraction of the heat convertible into work—is consequently greater. In practice, although the gas-engine as yet falls short of its ideal efficiency to a much greater extent than does the steam-engine, it is actually the more efficient of the two. A pound of fuel converted into gas and used in a modern gas engine gives a better return in mechanical work than if it were burned in the furnace of a steam-engine of the most economical type. For small powers the gas-engine has the great practical merit, as compared with the steam-engine, of dispensing with the attendance which a boiler and furnace would require. This consideration has made it in many thousands of cases an economical motor even when the gas it uses is of the comparatively costly kind supplied for illuminating purposes.

From the year 1823 onwards a number of proposals were made by Brown, Wright, Barnett, and others for the construction of engines to work by the explosive combustion of gas. Although in some instances these inventions anticipated later successful engines, and although the details were often carefully elaborated, no practical success was attained till 1860, when an effective gas-engine was brought into public use by M. Lenoir.

Lenoir's engine resembled in appearance a single-cylinder horizontal steam-engine. As the piston advanced it drew in an explosive mixture of gas and air. About mid-stroke this was ignited by an electric spark, and for the remainder of the stroke work was done through the pressure of the hot products of the explosion. During the back-stroke these products were expelled to the atmosphere, while on the other side of the piston a fresh explosive mixture was being taken in and exploded at mid-stroke as before. To keep the cylinder cool enough to admit of lubrication it was surrounded by an external casing within which cold water was caused to circulate. This water-jacket has continued to be a feature of nearly all modern gas-engines. An indicator-diagram from Lenoir's engine is shown in fig. 1. From A to B the gas and air are

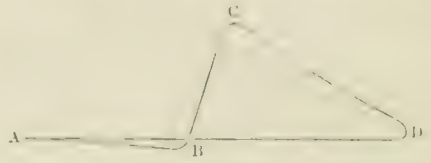


Fig. 1.—Indicator-diagram of Lenoir's Engine.

being sucked in. The rapid rise of pressure from B to C is due to the ignition of the mixture. After C the hot products of combustion go on expanding to the end of the stroke, D, and the pressure diminishes although (as recent investigations have shown) the process of combustion is to some extent continued into this stage. The back-stroke, DA, expels the burned gases at atmospheric pressure.

Lenoir's engine used about 95 cubic feet of gas per horse-power per hour, which is about five times the quantity required by the best gas-engines of the present day. Its poor economy was mainly due to the small amount of expansion which the hot gases underwent after the explosion. Another drawback was that the average pressure upon the piston was so low as to make the engine bulky in proportion to the work performed by it. These defects are remedied in modern gas-engines by compressing the mixture before it is exploded, so that a greater range of expansion is required to reduce the burned gases to the atmospheric pressure at which they are expelled. This secures greater efficiency, while at the same time the higher mean effective pressure of the working substance permits an engine of a given size to have more power. Compression of the explosive mixture had been proposed by Barnett as early as 1838, and was a feature in several later patents; but its advantages were first practically realised in the well-known and highly successful engine of Otto, which dates from 1876.

Nine years earlier (in 1867) a gas-engine had been commercially introduced by Otto in conjunction with Langen which, although now obsolete, deserves mention both on account of the success which it achieved and the peculiarity of its action. The Otto and Langen engine was of the free-piston type (originally proposed by Barranti and Matteucci in 1857). There was no compression of the explosive mixture; it was taken in during the early part of the up-stroke of a piston which rose in a vertical cylinder. Then the mixture was ignited by being brought into momentary contact with a

flame through the action of a special slide-valve. Under the impulse of the explosion the piston rose with great velocity to the top of its stroke, being free to rise without doing work on the engine shaft. The burned gases then cooled, and their pressure fell below that of the atmosphere. The piston was therefore urged down by the pressure of the air, and in coming down it was automatically put into gear with the shaft, and so did work, the products of combustion being expelled during the last part of the down-stroke. The engine was excessively noisy, but it took less than half the amount of gas that had been taken by Lenoir.

Otto's invention of 1876 again halved the consumption of gas, and quickly raised the gas-engine to the position of a commercially important motor. Its success may be judged from the fact that in 1889 there were some thirty thousand engines of this type in use, of sizes which give from 100 horse-power down to a fraction of 1 horse-power. In the Otto engine the cylinder is generally horizontal and single-acting, with a trunk piston, and it takes two revolutions of the crank-shaft to complete a cycle of operations. During the first forward stroke gas and air are drawn in, in the proportion proper to form an explosive mixture. During the first backward stroke the mixture is compressed into a large clearance space behind the piston. When the next forward stroke is about to begin, the compressed mixture is ignited, and work is done by the heated gases during the second forward stroke. The second backward stroke completes the cycle by causing the burned gases to be expelled into an exhaust-pipe leading to the outer air. The clearance space is, however, left full of burned gases, and this portion of the previous charge is allowed to mix with the fresh air and gas which is drawn in during the first forward stroke of the next cycle. Since only one of the four strokes which are required to complete a cycle is effective in doing work, a massive fly-wheel, running fast, is used to furnish a large magazine of energy, and in cases where exceptional uniformity of speed is important—as, for instance, in electric lighting—it is usual to have two heavy fly-wheels. A centrifugal governor controls the engine by cutting off the supply of gas when the speed exceeds a prescribed limit. The cylinder is kept moderately cool by the circulation of cold water in a water-jacket; and the usual means of igniting the charge is a slide-valve, the construction of which is described below.

The general appearance of an Otto engine, as made by Messrs Crossley Brothers, is too well known to need an extended description. It resembles a single-cylinder horizontal steam-engine, heavily built and mounted on a somewhat high bed-plate.

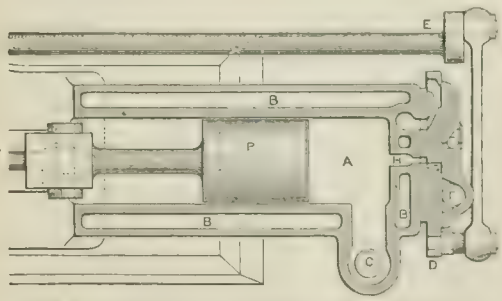


Fig. 2.—Section through Cylinder of Otto's Engine.

In the smallest forms a vertical arrangement of the cylinder is adopted, and for the largest powers a pair of horizontal cylinders are set side by side. Fig. 2 shows some of the principal details by a horizontal section through the cylinder. The piston, P, appears in the figure at the back end of its stroke, and the space A is the clearance. Its volume is usually from two to three fifths of the volume swept through by the piston. BBB is the water-jacket. C is the exhaust-valve, which is opened by the action of a revolving cam during the second back-stroke of the cycle. The slide valve, D, is made to slide backwards and forwards across the back end of the cylinder by means of a connecting-rod driven by a short crank on the lay-shaft, E, which is driven by bevel or screw gear from the main shaft, so that it turns once for two revolutions of the main shaft. This valve serves to admit gas and air, and also to carry an igniting flame to the mixture after compression in the cylinder. An igniting jet is kept burning at F, behind the valve. In the valve there is a small chamber, G, supplied with gas, and as this passes the jet it ignites and continues burning until by the further movement of the valve the chamber, G, communicates with the cylinder through the opening H, by which time the back of the chamber is closed. In a number of recent Otto engines the ignition of the mixture is brought about in a different way. There is a short tube closed at one end and communicating at the other with the cylinder, through a valve. The tube is kept red-hot by a Bunsen-flame playing round it, and at the proper moment a portion of the charge within the cylinder is allowed access to the red-hot tube through the valve.

Fig. 3 is a copy of an indicator-diagram from an Otto engine. AB is the first stroke of the cycle,

Fig. 3. Indicator-diagram of Otto's Engine.

and corresponds to the taking in of gas and air at a pressure sensibly the same as that of the atmosphere. BC is the compression stroke. At C ignition takes place and raises the pressure quickly to D. CDEB is the effective forward stroke, and the exhaust-valve is opened for the escape of the waste gases near the end of this stroke at E. The expulsion of the gases goes on from B as the piston moves back to A, and this completes the cycle.

There are now a number of other successful gas-engines which more or less resemble Otto's. In Clerk's engine a similar cycle is performed, except that there is an explosion at each forward stroke. The waste gases escape through exhaust-ports near the front end of the cylinder, which are uncovered by the advance of the piston, and a displacer cylinder or pump immediately forces in a fresh mixture, which is compressed during the return stroke. In Andrew's (the Stockport) engine, and in Robson's (made by Messrs Tangye), an impulse in every revolution is secured by compressing the explosive mixture in a pump, which in some cases is supplied by using the front end of the working cylinder itself for this purpose. In the 'Griffin' engine (Messrs Dick, Kerr, & Co.) explosion occurs at both ends of the cylinder, but only at every third stroke: the cycle includes the drawing in and rejecting of a 'scavenger' charge of air, as well as the drawing in and compression of the explosive mixture and the rejection of the burned gases. A recent engine

possessing much originality is Atkinson's, the distinctive features of which are shown in fig. 4. Here the piston acts on the crank shaft not directly but through a toggle-joint, which has the effect of compelling the piston to make four single strokes for one revolution of the shaft. The four strokes are of different lengths. In the first forward stroke the piston starts from the back end of the cylinder and draws in gas and air. Returning it makes a shorter stroke, compressing the mixture into a space not swept through. Then the mixture is fired, and work is done during another and considerably longer forward stroke, and finally the cycle is completed by a return stroke, which is long enough to completely expel the burned gases. The mixture is ignited by means of a red-hot tube, but in this case there is no valve to control the time of firing; it is determined simply by the compression of the explosive mixture against a cushion of waste gas in the top of the tube. Fig. 5 is an indicator-diagram from Atkinson's engine. AB is the admission stroke. From B to C the explosive mixture is compressed; at C it is fired, and the effective working stroke, CDE, begins. Its length is more than twice that of the compression stroke. In the long return stroke, EA, the products of combustion are wholly expelled, except for a small quantity contained in the clearance space, which is no greater than the clearance necessarily left behind any piston. This complete (or, to be more exact, nearly complete) expulsion of the burned gases is a good feature in Atkinson's cycle, but the most distinctive merit is the relatively long working stroke, which secures much expansion, so that the gases do not escape until their pressure falls to a value not greatly exceeding that of the atmosphere, and at the same time makes the expansion occur quickly, giving the hot gases comparatively little time to part with their heat to the lining of the cylinder.

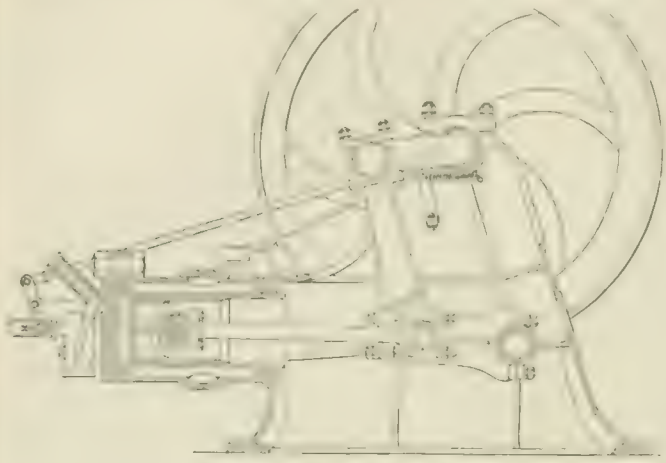


Fig. 4. Atkinson's Gas engine.

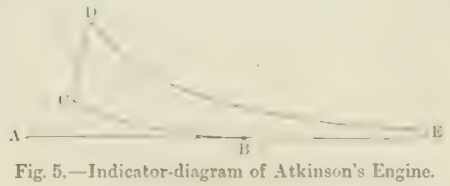


Fig. 5.—Indicator-diagram of Atkinson's Engine.

Messrs Crossley have lately introduced a modified form of Otto engine, with two equal cylinders, the pistons of which make their strokes simultaneously. The mixture is compressed, exploded, and expanded first behind one piston; then the products of combustion are allowed to pass to the front end of both cylinders, driving back both pistons, and undergoing further expansion. Meanwhile the other cylinder has taken in a fresh charge, which is now compressed behind its piston, and is exploded when the next forward stroke begins.

During the explosion in a gas-engine cylinder the highest value of the pressure is usually from 180 to 200 lb. per square inch, and the highest temperature is about 3000° F. The process of explosion is by no means instantaneous. After ignition the pressure and temperature rise with great rapidity, as the indicator diagrams (figs. 3 and 5) show, but combustion is not complete when the highest point in the diagram has been reached. Only about 60 per cent. of the whole heat which the combustion of the gas should yield is developed up to that point. During the subsequent expansion a slow process of continued combustion goes on, in which a considerable part of the remaining 40 per cent. is set free; but even when the contents of the cylinder escape to the exhaust the process is generally still incomplete. The after-burning, as it is called, which occurs during expansion, after the point of highest pressure has been passed, has the effect of keeping the pressure of the expanding gas from falling so fast as it otherwise would fall. But for this the expansion curve on the indicator-diagram would fall very rapidly, owing to the cooling of the gases through their contact with the cylinder walls. During expansion the gases are parting with much heat to the walls, but the after-burning supplies nearly enough additional heat to make good this loss—sometimes, indeed, more than enough—and the result is that the form of the expansion curve does not differ very materially from that of an adiabatic line. The experiments of Mr Dugald Clerk, who has taken much pains to investigate this action, show that the time-rate of the explosion depends greatly on the richness of the explosive mixture. When the mixture is much diluted the process is so slow that the point of highest pressure is not reached until far on in the stroke.

Though the maximum temperature within the cylinder is materially reduced by this want of perfect suddenness in the combustion of the gas, it is still so high that in engines of even very moderate size a water-jacket is essential. The actual maximum temperature of the gases is in fact higher than the melting-point of cast-iron, while the temperature of the metal has to be kept low enough not to burn oil. The water-jacket involves an immense waste of heat. In the most favourable cases it absorbs 27 per cent. of the whole heat which would be produced by complete combustion of the gaseous mixture, and more generally the amount it absorbs ranges from 40 to 50 per cent. The best existing gas-engines succeed in converting into work about 22 per cent. of the whole potential energy of the fuel; of the remaining 78 per cent. a half or more generally goes to heat the water which circulates in the jacket, and the remainder is rejected in the exhaust, partly through incomplete combustion, but mainly in the form of actual heat, on account of the high temperature at which the waste gases escape. Attempts have been made to save a part of this loss

by the application to gas-engines of the regenerative principle which has done so much to promote economy of heat in metallurgical operations. It was proposed by Siemens to use a separate combustion chamber, which, being distinct from the working cylinder, might be kept always hot, and to pass the outgoing gases through a regenerator, which would take up their heat and give it back to the incoming air. Much the same end was aimed at by Fleeming Jenkin, who tried to adapt the regenerative engine of Stirling (see AIR-ENGINE) to serve for the internal combustion of gas. These attempts have hitherto failed, and the gas-engine still falls far short of the limit of thermodynamic efficiency which its high range of temperature shows it to be theoretically capable of. The greatest ideal efficiency of any heat-engine is measured by the fraction $\frac{\tau_1 - \tau_2}{\tau_1}$, where τ_1 is the highest (absolute) temperature at which it can receive heat, and τ_2 is the lowest (absolute) temperature at which it can reject heat. The highest temperature in the combustion is, as we have seen, about 3000° F., and the lower limit of the range is the atmospheric temperature, or say 60° F. Substituting these values in the formula, we have 0·85 as the highest ideal efficiency; in other words, it should be, from the thermodynamic point of view, theoretically possible to convert 85 per cent. of the heat-energy of the gas into work. The greatest efficiency hitherto realised is about 0·22, or little more than one-fourth of the ideal efficiency. It must not be supposed that under any imaginable practical conditions it could be possible to reach the ideal limit, but it may be confidently expected that the gas-engine of the future will approach it much more closely than does the gas-engine of to-day. The comparison serves to show how much room there is for invention in the direction of obviating what is essentially preventable loss.

It is instructive in this connection to compare the efficiency of gas-engines with that of steam-engines. In a large steam-engine the efficiency is about 0·15; in other words, the engine converts into work only some 15 per cent. of the heat-energy supplied to the steam, and the figure would be greatly less if one stated it as a fraction of the whole heat of combustion of the fuel. In steam-engines small enough to be fairly comparable with actual gas-engines, the efficiency is rarely more, and generally a good deal less, than 0·1. Considered as a thermodynamic machine, the gas-engine, imperfect as it admittedly is, is already not far from twice as efficient as the steam-engine. It is in fact the most efficient heat-engine we possess.

Experiments show that the consumption of gas in practice in a small gas-engine (indicating 10 horse-power or more) may, in favourable cases, be less than 20 cubic feet per hour per indicated horse-power, including the gas which is consumed in maintaining the igniting flame. Of the indicated horse-power about 85 per cent. is available for doing mechanical work outside of the engine itself. The cost of the fuel is necessarily high so long as the gas supplied to the engine is the purified coal-gas used for lighting. Thus, with gas costing 3s. per 1000 cubic feet, the supply required for each indicated horse-power per hour will cost about three-farthings, whereas the coal bill of a steam-engine for each horse-power hour need not exceed a fifth of a penny, and may be even less. In such cases the advantage of the gas-engine lies in its compactness and convenience, in the saving of charges for attendance, and in the ease and economy with which it can be applied to do intermittent work. Economy in the cost of fuel may, however, be secured by supplying the engine with a cheaper kind of gas, a gas suitable for heating though not suitable for illumination. The late Sir William Siemens pointed out that a comparatively cheap gas of the kind required might be got by separating successive stages in the distillation of coal, and advised supplying of towns with such a gas for heat and power through distinct mains. Another gas for gas-engines is that produced by Mr Emerson Dowson's process of blowing a mixture of air and steam through a bed of red-hot anthracite or coke. The product contains 22½ per cent. of hydrogen and the same quantity of carbonic oxide, mixed with much nitrogen and a small quantity of carbonic acid, and is said to cost about 2½d. per 1000 cubic feet. The engine requires about four times as much of it as it would require of illuminating coal-gas. When Dowson gas is used, the fuel needed for a gas-engine is not more than 1½ lb. of coke or anthracite per horse-power per hour—as compared with the 4 or 5 lb. burned in a steam-engine of corresponding size.

Gas-engines have recently been applied with great success on the Continent to the propulsion of tramcars, which carry compression-cylinders. The gas from the mains is driven by pumping-engines into a compression-reservoir: the car runs up outside the station, and the reservoir is connected with the car cylinders, which promptly become refilled under a high pressure: the stopcock is closed, the connecting-tube removed, and the car is again ready.

A notice of gas-engines would be incomplete without a reference to *oil-engines* using petroleum as fuel, which is vaporised and then exploded along with air. In Priestman's engine the petroleum, which is a safe oil with a flashing-point higher than 75° F., is injected in the form of spray, by a jet of compressed air, into a chamber which is heated by means of a jacket through which the hot gases of the exhaust pass. There the spray is raised to a temperature of about 300°, and is completely vaporised. From the hot chamber the vapour is drawn, along with more air, into the working cylinder, where the cycle of operations is essentially the same as in Otto's engine. In some types, only 1¼ lb. of oil is burned per brake horse-power per hour. The compactness and smoothness of working of these oil-spray motors has made it possible to adapt them to vehicles, from tramcars to tricycles; and innumerable types of 'auto-cars' or 'motor-cars' have been perfected, and since 1896 (see TRACTION-ENGINES) have become familiar even on the roads of remote country districts.

See works by D. Clerk (1886), W. MacGregor (1883), and Bryan Donkin (1894), Professor Perry, *The Steam-Engine, and Gas and Oil Engines* (1899); and numerous papers in Engineering magazines.

Gaskell, MRS, novelist, was born at Cheyne Row, Chelsea, 29th September 1810. Her maiden name was Elizabeth Cleghorn Stevenson, and her father was in succession teacher, preacher, farmer, boarding-house keeper, writer, and Keeper of the Records to the Treasury. She was brought up by an aunt at Knutsford—the Cranford which she was yet to describe with such truthful patience; was carefully educated, and married in 1832 William Gaskell (1805–84), a Unitarian minister in Manchester. In 1848 she published anonymously her *Mary Barton*, which at once arrested public attention. It was followed by *The Moorland Cottage* (1850), *Cranford* (1853), *Ruth* (1853), *North and South* (1855), *Round the Sofa* (1859), *Right at Last* (1860), *Sylvia's Lovers* (1863), *Cousin Phillis* (1865), and *Wives and Daughters* (1865), a series of novels that have permanently enriched English literature, and almost lifted their authoress into a rank represented alone by Jane Austen, Charlotte Brontë, and

George Eliot. Mrs Gaskell had some measure of almost all the gifts of the great novelist—deep and genuine pathos, a singularly genial and truthful humour, a graceful and unforced style, power of description, dramatic faculty on occasion, and sympathetic insight into character; while she wrote of nothing that she did not know and understand—indeed many passages are close transcripts from her own life-history and experience. Though written with a purpose, her novels have not failed to be completely artistic, perhaps because they flowed so freely from her heart, and because their purpose was so truly and so much herself. Mrs Gaskell died suddenly of heart-disease at Holybourne, Alton, in Hampshire, 12th November 1865, and was fittingly buried at Knutsford. Besides her novels she wrote *The Life of Charlotte Brontë* (1857), which will remain one of the masterpieces of English biography. *Mary Barton* was received as a revelation of the habits, thoughts, privations, and struggles of the industrial poor, as these are to be found in such a social beehive as Manchester, and has had many imitators, but not an equal.

Gasolene, or GAZOLINE, rectified petroleum (q.v.) used for gas engines and horseless carriages.

Gasometer. See GAS LIGHTING.

Gasparin, VALERIE BOISSIER, COMTESSE DE, was born at Geneva in 1813, and married Count Agenor de Gasparin (1810–71), a zealous advocate of religious liberty. Till her death, 18th June 1894, she warmly supported the reformed faith, but denounced the extravagances of fanatics. Two of her works obtained the Montyon prize at the Academie Française: *Le Mariage au point de vue Chrétien*, and *Il y a des Pauvres à Paris, et ailleurs*. Among her other publications are *Voyage dans le Midi par une ignorante*, *Allons jouir Fortune à Paris*, *Un Livre pour les Femmes Mariées*, *Lisez et Jugez* (Strictures on the 'Salvation Army'), and *Les Horizons Prochaines*. Several of her books have been translated into English.

Gaspé, a peninsula in the east of Quebec province, comprising the counties of Gaspé and Bonaventure, projects into the Gulf of St Lawrence, between the estuary of that name on the north and the Bay of Chaleurs on the south. It has an area of nearly 8000 sq. m., and about 35,000 inhabitants, the greater number engaged in the important fisheries, which, with the export of lumber, form the staple business of the country.—GASPÉ BASIN, where Cartier landed in 1534 (see CANADA), is a port of entry in Gaspe Bay, now the seat of extensive fisheries. Pop. 726.

Gassendi, or GASSEND, PIERRE, French philosopher and mathematician, was born 22d January 1592, at Champtercier, a village of Provence. His unusual powers of mind showed themselves at an early age. Having resolved upon an ecclesiastical career, he studied, and afterwards taught, philosophy at Aix. But, catching the infection of empirical methods of study, he revolted from the predominant scholastic philosophy, and began to subject it to a critical scrutiny. At the same time he bent his energies upon physics and astronomy. The results of his examination of the Aristotelian system and methods appeared at Grenoble in 1624, *Exercitationes paradoxicæ adversus Aristoteleos*, in which he utters an emphatic protest against accepting the Aristotelian dicta as final in all matters of philosophy, and especially of physics. In the same year he was appointed *prévôt* of the cathedral at Digne, an office which enabled him to pursue without distraction his researches in astronomy and other natural sciences. From 1628 he spent several years travelling through Holland, Flanders, and France, until in 1645 he was appointed professor of Mathematics in the Collège Royal de France, at Paris, where he died, 14th October 1655. During his stay in the Low Countries he controverted (1631) the mystical opinions of Robert Fludd, and wrote a treatise on parhelia, besides other astronomical papers. Eleven years later he proceeded also to criticise adversely the new system of philosophy promulgated by Descartes, in a work entitled *Objectiones ad Meditationes Cartesii*. Whilst at Paris Gassendi wrote his principal philosophical works, *De Vita Epicuri* (1647); a commentary on Diogenes Laertius' tenth book, *De Vita, Moribus, et Placitis Epicuri* (1649); and in the same year the *Syntagma Philosophiæ Epicuræ*, which contains a complete view of the system of Epicurus. But, whilst thus going back to the ancients in his philosophy, Gassendi marched in the van of the moderns in natural and physical science. Kepler and Galileo were numbered amongst his friends. His *Institutio Astronomica* (1647) is a clear and connected representation of the state of the science in his own day; in his *Tychonis Brahæi, Nicolai Copernici, Georgii Purbachii, et Joannis Regiomontani Vitæ* (Paris, 1654) he gives not only a masterly account of the lives of these men, but likewise a complete history of astronomy down to his own time. His collected works were published by Montmort and Sorbière (6 vols. Lyons, 1658), and by Averrani (6 vols. Flor. 1728).

Gassner, JOHANN JOSEPH, exorcist, was born 28th August 1727, near Bludenz, in the Vorarlberg, and became Catholic priest at Klösterle, in the diocese of Coire. He began to cure the sick by driving out the demons that possessed them by means of exorcism and prayer. In 1774 he received the sanction of the Bishop of Ratisbon; and by the mere word of command, *Cesset* ('Give over'), he cured the lame or blind, but especially those afflicted with convulsions and epilepsy, who were all supposed to be possessed by the devil. Ultimately he was found to be an impostor; the archbishops of Prague and Salzburg issued pastorals against his imposture, and the imperial authorities compelled the Bishop of Ratisbon to dismiss him. The bishop, however, gave him the cure of Bendorf, and there he died in 1779.

Gas-tar. See COAL-TAR, GAS, ANILINE, DYEING, &c.

Gastein, a romantic valley in the south of the Austrian duchy of Salzburg, 28 miles long, with a number of small villages. The chief of these, Wildbad-Gastein, is a very famous watering-place, and was a favourite resort of the Emperor William I. of Germany. Some 5000 guests visit the place in summer to drink the waters of its seven warm springs. Here, on 14th August 1865, a convention was signed between Austria and Prussia, which, by a partition of Sleswick and Holstein, for a short period prevented the rupture between the rival powers. Pop. of the valley, about 4000. See W. Fraser Rae's *Austrian Health Resorts* (1885).

Gasteropoda (Gr., 'belly-footed'), a large class of molluscs, including snails, slugs, buckies, whelks, cowries, limpets, and the like. Along with the cuttle-fishes or Cephalopods, and the yet more closely allied 'butterfly-snails' or Pteropods, the Gasteropods are contrasted with the bivalves or Lamellibranchs by the more or less prominent development of the head-region, and by the presence of a rasping ribbon or tongue on the floor of the mouth.

General Characters.—In addition to the development of head and rasping tongue, the Gasteropods are characterised by the nature of the 'foot' or muscular ventral surface. Except in some forms adapted for free-swimming, the 'foot' is simple,

median, and sole-like. It is the surface on which the animal crawls, and is often divided into anterior, median, and posterior regions. The wealth of modification included in the class is so great that no other general characters can be given.

General Survey.—(A) The simplest Gasteropods, such as the common Chiton, are symmetrical, not

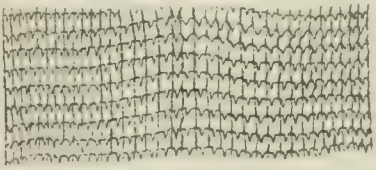


Fig. 1.—Part of the Rasper of the Snail (from Howes).

lop-sided like the higher forms. They have the mouth at one end of the long axis of the body, the anus at the other; the gills, kidneys, genital ducts, and circulatory organs are paired; there are two pairs (pedal and visceral) of nerve cords running parallel to one another along the body, and the ganglia are slightly developed. Of all molluscs these simplest Gasteropods are probably nearest the hypothetical worm-like ancestor. In one order (Chitons, q.v.) there are eight shells, one behind the other like segments; in the two other orders (Neomeniæ and Chætoderma) the shell is represented only by calcareous plates and spines in the skin. These three orders form the sub-class Isopleura, in contrast to all the others which are unsymmetrical—the Anisopleura.

(B) The latter are grouped first of all according to the state of the loop formed by the visceral nerves. (1) In one series the visceral nerve-loop is implicated and twisted in the torsion of the asymmetrical body, and furthermore the sexes are separate. These are known as Streptoneura ('loop-nerved'), and include limpets (Patella), ear-shells (Haliotis), pond-snail (Paludina), cowries (Cypræa), cone-shells (Conus), buckies (Buccinum), and the free-swimming Heteropods. This division includes what are often called Prosobranchs, and the numerous genera are further arranged according to the characters of the gills, kidneys, and foot. (2) In another series the visceral loop is not twisted, and is often very short; the shell is light and often lost in the adult; and the animals are hermaphrodite. They are known as Euthyneura ('straight-nerved'), and include two sets—Opisthobranchs and Pulmonates. Among Opisthobranchs some retain the usual mantle-fold and have a delicate shell—e.g. Bulla and Aplysia, while others (known as Nudibranchs) have their mantle atrophied and no shell—e.g. Doris and Eolis. Lastly there are the Pulmonates, where gills are replaced by an air-breathing mantle-cavity, as in snails (e.g. Helix), slugs (e.g. Arion), water-snails (e.g. Lymnæus).

Fig. 2.—A Whelk: Showing respiratory siphon, *a*; head with tentacles, *b*, and eyes, *d*; foot, *b*, with shell-lid or operculum, *c*.

Mode of Life.—Though the number of terrestrial Gasteropods, breathing the air directly by means of a pulmonary chamber, is very large—over 6000 living species—those living in water are greatly in the majority, including over 10,000 forms, mostly marine. Of these, some 9000 or so belong to the Prosobranchs or Streptoneura, a relatively small minority being Opisthobranchs and Nudibranchs. The Heteropods and some Opisthobranchs enjoy a free-swimming pelagic life, but most marine forms frequent the coasts either on the shores or along the bottom. Deep-sea Gasteropods are comparatively few. The locomotion effected by the contractions of the muscular 'foot' is in almost all cases very leisurely, and the average tendency is towards sluggishness. As to diet, the greatest variety obtains; most Prosobranchs with a respiratory siphon and a corresponding notch in the shell are carnivorous, and so are the active Heteropods: most of the rest are vegetarian in diet. Numerous genera, both marine and terrestrial, are very indiscriminate in their feeding; others are as markedly specialists, keeping almost exclusively to some one vegetable or animal diet. Some marine snails partial to Echinoderms have got over the digestive difficulty presented by the calcareous character of the skins of their victims by a secretion of free sulphuric acid from the mouth. This acid changes the carbonate of lime into sulphate, which is brittle and readily pulverised by the rasping tongue. A few are parasitic—e.g. Eulima, Stylifer, and the very degenerate *Entoconcha mirabilis*, all occurring in or on Holothurians.

Fig. 3. Young Pond Snail (*Lymnæus*) (from Howes).

Distribution.—A few Gasteropods occur in strata as far back as the Cambrian, from which remote period they have continued with a steady increase. Almost all the Palæozoic genera are now extinct, and during these ages the siphon-possessing forms seem to have been almost, if not altogether, unrepresented. A host of new Gasteropods appeared in the Jurassic period, and many of the modern families have their origin in Cretaceous times. Numerous as the fossil forms are, the number of types wholly extinct is comparatively small; both as regards persistence of types and increase of numbers, the Gasteropods are a peculiarly successful class.

Life history. The eggs of Gasteropods are usually small, and are surrounded with albumen, the surface of which becomes firm, while in the common snail (Helix) and some others there is an egg-shell of lime. The eggs not unfrequently develop into embryos within the parent, but in most cases they are laid, either singly or in masses, and often within cocoons. Few objects are more familiar on the seashore than the clustered egg-cases of the whelk, which together form a ball often about the size of an orange. Inside each of the numerous egg-cases are many embryos, but only a few reach maturity, the others serving as food material, an infantile cannibalism or struggle for existence not uncommon in the class. As to the actual development and the larval forms, reference must be made

Fig. 4. Section of Triton-shell (after Owen):

to the articles on Molluscs and on Embryology; but it may be noted that the ovum divides more or less unequally, according to the amount of yolk, that a gastrula stage occurs as usual, and that this is succeeded in typical cases, first by a 'Trochosphere' and afterwards by a 'Veliger' larva (see Molluscs).

General Interest.—As voracious animals, furnished with powerful rasping organs, many Gasteropods play an important part in the struggle for existence among marine organisms, while other terrestrial forms are most destructive devastators of vegetable and flowering plants. The manner in which numerous plants are saved from the ravages of snails, by their chemical and physical characters, is an interesting subject of investigation recently worked out by Professor E. Stahl. From very early times, various Gasteropods, such as whelks, have been utilised for human consumption and also as bait, while yet more frequently the shells, often so beautiful in form and colour, have been used for the decoration of the person and the dwelling, for the basis of cameos, as domestic utensils, or even as weapons, and in many other ways. From the mucous glands of the roof of the gill cavity in the genera Purpura and Murex, there exudes the famous secretion, at first colourless, but afterwards becoming purple or violet, which furnished the ancient Tyrian dye.

See Chiton, Limpet, Mollusca, Heteropoda, Snail, Whelk, and articles dealing with various Gasteropods above mentioned. Also the zoological text books of Claus, Gegenbaur, Huxley, &c.; Hatchett-Jackson's ed. of Rolleston's *Forms of Animal Life* (Oxford, 1888); Keferstein's 'Mollusca,' in Bronn's *Thierreich* (1862–66); E. Ray Lankester, article 'Mollusca,' *Encyc. Brit.* (vol. xvi. 1885); Woodward, *Manual of Mollusca* (3d ed. 1875).

Gaston de Foix. See Foix.

Gastræa, Gastrula. See Embryology.

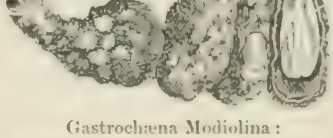
Gastralgia. See Cardialgia.

Gastric Fever. See Typhoid Fever.

Gastric Juice. See Digestion.

Gastritis. See Stomach (Diseases of).

Gastrocha'na, a genus of boring bivalves, not far removed from Teredo and Pholas, but type of a distinct family, Gastrochænidæ, which also includes the remarkable Aspergillum (q.v.) and Clavagella (q.v.). The original shell has the two valves typical of Lamellibranchs; but these are delicate, and become surrounded by a secondary tubular shell lining the cavity which the mollusc bores in limestone, coral, other shells, &c. *G. modiolina*, a rare British mollusc, common in the Mediterranean, makes holes about two inches deep and half an inch in diameter. It sometimes bores right through an oyster into the ground below, and makes for itself, plus little stones and particles of debris, a flask-shaped case, with its neck fixed in the oyster-shell. The tubes of some of the tropical species—e.g. *G. clava*, from the Indian Ocean, which live in sand are very curious.



Gastrochæna Modiolina:
a, one of the valves of an open shell, showing the valves.

Gastrostomy (Gr. *gaster*, 'the belly or stomach;' and *stoma*, 'mouth'), an operation performed for the relief of stricture of the gullet, to save the patient from the imminent risk of starvation by introducing food directly into the stomach through an external opening. The well-known case of Alexis St Martin, a Canadian, in whom in consequence of a gunshot wound there was a fistulous opening into the interior of his stomach, the success of operations for the removal of foreign bodies from the stomach, and numerous experiments on the lower animals, led to this attempt to save life; and when it is not delayed too long it has proved successful in a fair proportion of cases.

Gastrotomy (Gr. *gaster* and *tomē*, 'an incision'), an incision into the cavity of the Abdomen (q.v.) generally for the purpose of removing some diseased texture or foreign body. The term has also been applied to Cæsarean Operation (q.v.).

Gataker, Thomas, English divine, was born in London in 1574, and educated at St John's College, Cambridge. In succession preacher at Lincoln's Inn, rector of Rotherhithe, and member of the Assembly of Divines at Westminster, he opposed the imposition of the Covenant, and was one of the forty-seven London clergymen who condemned the trial of Charles I. He died in 1654. His works include *Of the Nature and Use of Lots* (1616); and *Cinnus, sive Adversaria Miscellanea* (1651).

Gatchina, a town of Russia, 30 miles by rail SSW. of St Petersburg. It has some manufactures of porcelain, and several barracks, but is especially worthy of mention for its royal palace, surrounded by one of the finest pleasure-gardens in Europe, which was the favourite summer seat of the Emperor Paul I., and the winter residence—practically, owing to precautions against Nihilists, the prison—of Alexander III. Pop. (1880) 10,063.

Gates, Horatio, an American general, was born at Maldon, in Essex, England, in 1728. He entered the English army, served in America, where he was major under Braddock, and with difficulty escaped in the defeat in which that officer was slain. On the peace of 1763 he purchased an estate in Virginia, where he resided until the war of independence. In this struggle he sided with his adoptive country, and in 1775 was made adjutant-general, with the rank of brigadier, receiving in 1776 command of the army which had just retreated from Canada. In August 1777 he superseded Schuyler in command of the northern department; and, principally as the result of his predecessor's able manœuvres, he was enabled to defeat and compel the surrender of the British army at Saratoga in October (see Burgoyne). This success gained him a great reputation, which probably is accountable for his endeavour to supplant Washington in the chief command of the army; but this failing, he retired to his estate until 1780, when he was called to the command of the army of the South, and in the unfortunate defeat near Camden, in South Carolina, lost the laurels he had previously won. He was superseded, and was not acquitted of blame by court-martial until 1782. He then retired to Virginia till 1790, when he emancipated all his slaves, and settled in New York. There he died on April 10, 1806.

Gateshead, a town in England, on the northern verge of the county of Durham, and on the south bank of the river Tyne. Governed for centuries by a chief bailiff appointed by the prince-bishop of the palatinate, aided by popularly elected burgesses, Gateshead was enfranchised first as a parliamentary borough in 1832, and secondly as a municipal borough in 1835, whilst in 1888 it became a county borough. Its population has grown from 15,177 in 1831 to 25,568 in 1851, 65,855 in 1881, and 85,709 in 1891. Thus there is only one urban community along the main line between

London and Edinburgh which exceeds Gateshead in population; and the exception is the city of Newcastle-upon-Tyne, which is situated directly opposite Gateshead on the Northumberland or northern bank of the river. The two towns are intimately connected: a splendid suspension bridge (1871) joins them at Redheugh; Stephenson's celebrated High Level (1849) connects them by both road and rail; and a swing-bridge (1876), which opens to allow the passage of ships, connects the quayside of Newcastle with the principal thoroughfare of Gateshead. This close association of the two communities is not felt to be of advantage to the Durham borough, because the city on the Northumberland side of the Tyne levies under ancient charter local dues on all the river trade, which both towns promote, though the emoluments derived therefrom belong exclusively to Newcastle. The older portions of Gateshead have not during recent years been much improved. Many of the old stone buildings have been allowed to fall into considerable decay. Westward and southward extension and improvement are continuous, and the suburbs show many fine villas. The town community is for the greater part industrial. Engine-works, iron-shipyards, electric cable, hempen and wire rope manufactories, chemical works, cement-works, glass-works, and iron-works furnish employment to a large proportion of the inhabitants. The only philanthropic institutions in the town which do not owe their existence to modern public spirit are the grammar-school (1700) and the King James Hospital (1611) for poor brethren.

Numerous institutions depend for their support on voluntary contributions and on grants from local rates. These include successful boys' and girls' high schools, excellent swimming-baths, a useful dispensary, a hospital for the isolated treatment of infectious disease, a literary and scientific institute, a school of art, &c. Public libraries (circulating and reference) were inaugurated in 1886, which are free to all burgesses. Under the management of an energetic school-board formed in 1872, two higher-grade and some forty elementary schools educate 25,000 children. A free school was established in 1701. The town-hall and free library are among the architectural ornaments of the borough. There is a recreation ground on Windmill Hills; and a public park of 50 acres at Saltwell, opened in 1874. Besides other places of worship belonging to the various denominations, there are ten churches of the English establishment, including the venerable St Mary's, which in 1080 was the scene of the murder of Bishop Walcher by an English mob. Among places of interest in Gateshead are the site of the fire and explosion of 1854, which cost fifty lives, and destroyed a million pounds' worth of property; the extensive locomotive works of the North-Eastern Railway Company, the finest in the north of England; alleged traces of the ancient Roman headway or *gate's* head, from which the name of the town is said to be derived; the undoubted residence in the Hillgate district, during the writing of the immortal *Robinson Crusoe*, of Daniel Defoe; and the works at which large portions of the first Atlantic cable were manufactured. The quarries from which the world-famous Newcastle grindstones are obtained are also worked within the precincts of Gateshead, at Gateshead Fell. Gateshead continues to be represented, as in 1832, by one member in the House of Commons. For parliamentary and municipal purposes alike, the county borough is divided into ten wards. Its governing body consists of a mayor, ten aldermen, and thirty councillors. See Richard Welford's *History of Newcastle and Gateshead* (2 vols. 1884–85).

Gateway, the passage or opening in which a gate or large door is hung. This may be either an open way with side pillars or a covered way vaulted or roofed over. The gateway, being a most important point in all fortified places, is usually protected by various devices. It is flanked by towers with loopholes, from which assailants may be attacked, and is frequently overhung by a machicolated battlement, from which missiles of every description may be poured upon the besiegers. In the middle ages gateways were also fortified with one portcullis or more, and had frequently an outer work or barbican in front of the gate defended with drawbridges. City gates, and gates of large castles, have in all ages been the subjects of great care in construction; and when from some cause, such as the cessation of constant fighting, or a change in the mode of warfare, gateways have lost their importance in a military point of view they have maintained their position as important architectural works, and although no longer fortified have become ornamental. In very ancient times we read of the 'gate' as the most prominent part of a city, where proclamations were made, and where the kings administered justice. The Greek and Roman gates were frequently of great magnificence. The propylæa at Athens is a beautiful example, and the triumphal arches of the Romans are the ornamental offspring of their city gates. At Autun in France two Roman gateways, and at Trèves in Germany one, still exist, and formed the models on which early medieval gateways were designed. Most of the English towns have lost their walls and city gates; but a few, such as York and Chester, still retain them, and give us an idea of the buildings which formerly existed, but which now remain only in the name of the streets where they once stood. English castles retain more of their ancient gateways, and from these we may imagine the frowning aspect every town presented during the middle ages. Abbeys, colleges, and every class of buildings were shut in and defended by similar barriers; many of these still exist in Oxford and Cambridge, and the abbey gates of Canterbury and Bury St Edmunds are well-known specimens of monastic gateways. The feeling of personal freedom, which is so strong in England, must no doubt have tended greatly to hasten the demolition of these marks of feudalism; but in many parts of the Continent we still find these barriers kept up.

Gath, one of the five chief cities of the Philistines, was situated on the frontiers of Judah, and was in consequence a place of much importance in the wars between the Philistines and the Israelites. The famous giant, Goliath, who was slain by the youthful David, was a native. St Jerome describes it in his time as 'a very large village.' Its site (*Tel-es-Safieh*) is probably the Blanche Garde of the Crusaders, who built a castle here to command the Philistine plain.

Gatineau, a river of Quebec, in Canada, has its origin in a chain of lakes lying immediately north of 48° N. lat., and, after a SSW. course estimated at 400 miles, enters the Ottawa River, about a mile below Ottawa city.

Gatling, RICHARD JORDAN, born in 1818, in Hertford county, North Carolina, studied medicine but never practised, and is known for inventions as various as machines for sowing cotton and rice and for dressing hemp, a steam-plough, and the famous Gatling gun (1861–62), a revolving battery gun, usually having ten parallel barrels, and firing in some cases as many as 1200 shots a minute. See MACHINE GUNS.

Gatschina. See GATCHINA.

Gatty, Margaret. See Ewing.

Gau, a German word meaning, in a general way, district, but applied specially to a political division of ancient Germany, having relation to the arrangements for war and the administration of justice. The division into such districts was in force under the Franks in the 7th century; and at the head of the gau was the graf (see Count). As the grafdoms became more and more hereditary, the gau, as a political division, fell into disuse (about the 12th century), and only in the names of some places—Rheingau, Breisgau, Aargau, &c.—do the traces of it remain. See Hundred, Feudalism, Village Communities.

Gauchos are the herdsmen of the great plains of the Argentine Republic and Uruguay, where they live in rude huts with scanty furniture, and are chiefly employed in driving, catching, and slaughtering cattle. They are mostly of mixed Spanish and Indian descent, sparely built, and of great strength and endurance; they are most expert horsemen, and use the Lasso (q.v.) and Bolas (q.v.) with marvellous skill. Their dress consists of a rough jacket and trousers, over which a woollen *poncho* falls, heavy top-boots, and a wide-brimmed hat. Cheerful and hospitable, they are violent and vindictive when enraged, and are much given to drink and gambling. Inured to hardship and fatigue, they have played an important part in the revolutions of South America.

Gaudeamus, the beginning of a famous German students' song in dog Latin rhymes, of which the first line is *Gaudeamus igitur juvenes dum sumus* ('Let us therefore rejoice while we are young'). It was first printed, in a somewhat coarser form than the present, and with Latin and German verses alternating, in 1776; and follows rather closely the thought and expression of an ancient Latin hymn of the year 1267. See Schwetschke, *Zur Geschichte des Gaudeamus* (Halle, 1877).

Gauden, John. See Eikon Basilike.

Gauge, or Gage, an apparatus for measuring any special force or dimension; thus we have *pressure gauge*, *wind-gauge* (see Anemometer), *Rain gauge* (q.v.), *wire-gauge*, *button gauge*, &c. The simplest form of gauge of dimension is the common wire-gauge, by which the diameter of wire is measured. It is simply an oblong plate of steel, with notches of different widths cut upon the edge; these are numbered, and the size of the wire is determined by trying it in the different notches until the one is found which it exactly fits. The thickness of sheet-metal is tried by the same gauge. There is a great want of uniformity in these gauges—the Birmingham gauge for iron-wire, sheet-iron, and steel differing from that used for brass, silver, gold, &c.; and these again from the Lancashire gauges. It has been proposed, in order to obtain uniformity, and to enable definite descriptions and orders to be given with accuracy and certainty, that, instead of the arbitrary numbers of varying signification now in use, decimal parts of an inch, tenths, hundredths, thousandths, or still smaller fractions, if necessary, be used, and that these be used for all diameters and thicknesses, such as wires, sheet-metals, buttons, watch-glasses, &c.; but such a scale has not yet come into general use. The Birmingham wire-gauge has, however, been widely adopted. The gauge commonly used for buttons and such like larger diameters is a rule with a groove cut lengthwise down the middle. Another metal rule, with a brass head, slides in this, and by means of a thumb-pin may be pushed out at pleasure. The object to be measured is placed between *a* and *b* (fig. 1), and the width of this space is measured by graduations on the middle metal slide.

A very elegant and delicate gauge is used for measuring watch-glasses, and is applicable to many other purposes. On an oblong piece of sheet-metal two straight metal ridges are fixed in such a manner that they shall be inclined at a given angle to each other, as *ab* and *cd* (fig. 2). Now, let us suppose the angle to be such that the distance between *a* and *c* is 2 inches, and that between *b* and *d* is 1 inch, while the lengths *ab* and *cd* are 10 inches. It is evident that for every inch of descent from *a* and *c* towards *b* and *d* there will be a narrowing equal to $\frac{1}{10}$th of an inch; and for every tenth of an inch of such descent there will be a narrowing of $\frac{1}{100}$th of an inch, and so on: thus we may, by graduating downwards from *ac* to *bd*, measure tenths by units, hundredths by tenths, and so on to still finer quantities if required. This is applicable to lengths as well as diameters. By means of fine screws with large graduated heads, Messrs Whitworth have measured small pieces of steel to the one-millionth of an inch (see Micrometer). Pressure-gauges, wind-gauges, &c. will be treated under the special subjects.—In railways, the gauge means the distance between the rails (see Railways).—The term Gauging refers specially to the gauging of the contents of casks; and an excise officer (as gauging casks containing excisable liquors) is often called 'gauger.'

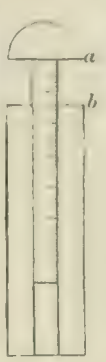


Fig. 1.

Fig. 2.

Gauhátí. See Assam.

Gaul. See France.

Gault (a local name in Cambridgeshire for clay) is one of the subdivisions of the Cretaceous System (q.v.). The gault is a stiff, bluish-gray clay, which here and there contains indurated nodules and septaria. Now and again it becomes somewhat calcareous, or sandy and micaceous. In some parts of Sussex a band of phosphatic nodules occurs at its base. The deposit is of variable thickness—reaching in some places over 300 feet, while occasionally it hardly attains a greater thickness than 50 feet, and forms a well-marked geological horizon—forming the bottom member of the Upper Cretaceous rocks. It is abundantly fossiliferous, the remains being almost exclusively marine, only a few drifted land-plants having been met with. One of the best exposures of the gault in England is at Folkestone. In the Isle of Wight this formation is known as the 'blue slipper,' from the readiness of the overlying beds to slip or slide over its surface. The picturesque 'Undercliff' owes its origin to these landslides. The gault is extensively employed in the manufacture of bricks and tiles; it forms a retentive and rather unproductive soil.

Gaultheria, a genus of small procumbent evergreen shrubs, of the order Ericaceæ, named by the Swedish botanist Kalm in honour of Dr Gaultier of Quebec. *G. procumbens* is a common plant in North America as far south as Virginia, and bears the names of Checkerberry, Partridge Berry, Deer Berry, Wintergreen, and Mountain Tea. It is about 4 or 5 inches in height, with

small whitish flowers and red 'berries,' which are eatable, but not safe in any considerable quantity, because of the pungent volatile oil which they contain. Brandy in which they have been steeped is used as a tonic. The whole plant has an agreeable aromatic odour and taste, and the volatile oil is used in medicine as a stimulant, also for flavouring syrups, and in perfumery, under the name of *Oil of Wintergreen*. An infusion of the berries (hence called 'tea-berries') was used as tea during the war of independence. The berries are employed for flavouring beer and other drinks, as also for tooth-powders and hair-washes. The leaf is astringent, and is used in medicine.—The Shallon

Shallon (*Gaultheria shallon*).

(*G. shallon*) is a large species (2–3 feet), with purple berries ('salal-berries'), which are largely eaten by the Indians of north-west America. It grows well in woods, and is sometimes planted in Britain to afford food for game.—*G. hispida* (Wax-cluster) is a native of Van Diemen's Land, bearing snow-white berries.—Other species, some fragrant, some producing edible berries, and all beautiful little shrubs, are found in mountain regions throughout the world. The Australian *G. antipoda* is said to be a finer fruit than *G. hispida*.

Gaunt. See GHENT; and for John of Gaunt, see JOHN OF GAUNT.

Gauntlet, less correctly GANTLET (formed with double diminutives from Old Fr. *gant*, 'a glove,' itself a word of Scandinavian origin), an iron glove, which formed part of the armour of knights and men-at-arms. The back of the hand was covered with plates jointed together, so as to permit the hand to close. Gauntlets were introduced about the 13th century. They were often thrown down by way of challenge, like gloves. They are of frequent occurrence in heraldry.

In the phrase 'to run the gantlet,' the word is due to a confusion with the foregoing of the original word *gantlope* or *gatlope*, the Swedish *gatlopp*, made up of *gata*, 'a street,' and *lopp*, 'a course,' from *lopa*, 'to run' -a cognate of Eng. *leap*. Professor Skeat suggests that the word may be due to the wars of Gustavus Adolphus, who died at Lützen in 1632. The German form is *gassenlaufen*, 'lane-run,' both alike meaning a military punishment, which consisted in making the culprit, naked to the waist, pass repeatedly through a lane formed of two rows of soldiers, each of whom gives him a stroke as he passes with a short stick or other similar weapon.

Gaur, the medieval capital of Bengal, also called Lakhnauti, is said to have been founded by the Vaidya king Lakshmanasena, at the close of the 11th century, and, on the Mohammedan conquest, a hundred years later, became the chief seat of the viceroys who governed Bengal under the Pathan kings of Delhi, and afterwards (but not always) of the independent kings of Bengal. On the Mogul conquest in 1575 a terrible pestilence broke out at Gaur, and thousands of the inhabitants perished; and from that time the city disappears from history, and its place is taken successively by Tandan, Dacca, and Murshidabad. The ruins of Gaur still cover a space of seven miles by two, on a branch of the Ganges, and include Hindu buildings as well as several interesting 15th-century Mohammedan mosques, besides extensive reservoirs, channels, and embanked roads. The vast accumulations of brick testify to the former density of the population, while the neighbouring ruins of Panduah and Tandan point to the existence of important suburbs, many of which have wholly disappeared. See Ravenshaw, *Gaur, its Ruins and Inscriptions* (1878); Fergusson, *History of Indian Architecture;* Lane-Poole, *Catalogue of Indian Coins in the British Museum.*

Gaur, or GOUR (*Bos Gaurus*), a species of ox, inhabiting some of the mountain jungles of India. It is of very large size, although apparently inferior to the Arnee (q.v.). It bears a considerable resemblance to the Gayal (q.v.), but differs from it in the form of its head, and in the total want of a dewlap, in which it more nearly agrees with the Banteng of the Eastern Archipelago, although distinguished from it by important anatomical peculiarities (see BANTENG). It is supposed to be incapable of domestication; frequent attempts for this purpose are said to have been made in Nepal. From its ferocity its pursuit is reckoned in India as exciting as that of tiger or elephant.

Gauss, JOHANN KARL FRIEDRICH, German mathematician, born at Brunswick, 30th April 1777, in 1801 published an important work on the theory of numbers and other analytical subjects, *Disquisitiones Arithmeticæ*. Shortly afterwards his attention was attracted to astronomy; and he invented, and used in brilliant fashion, new methods for the calculation of the orbits of planets, comets, &c. The fruits of his researches in this department appeared, two years after his appointment as professor of Mathematics and director of the observatory at Göttingen, in his *Theoria Motus Corporum Cœlestium* (1809). He also laboured with equally brilliant success in the science of geodesy, being appointed by the Hanoverian government to conduct the trigonometrical survey of the kingdom and to measure an arc of the meridian. Whilst engaged in this work he invented the instrument then called heliotrope (see HELIOGRAPHY). Later in life (in 1843–46) he published a collection of valuable memoirs on surface geometry, in *Ueber Gegenstände der höhern Geodäsie*. In the meantime he had also begun to study the problems arising out of the earth's magnetic properties. In 1833 he wrote his first work on the theory of magnetism, *Intensitas Vis Magneticæ Terrestris;* and in conjunction with W. E. Weber he invented the declination needle and a magnetometer. He was also mainly instrumental in founding a Magnetic Association, which published valuable papers, entitled *Resultate* (1836–39), including two by Gauss on the law of magnetic attraction. In applied mathematics he investigated the problems connected with the passage of light through a system of lenses, in *Dioptrische Untersuchungen* (1840). Besides the researches already mentioned he wrote papers or works on probability, the method of least squares, the theory of biquadratic residues, constructed tables for the conversion of fractions into decimals and of the number of classes of binary quadratic forms, and discussed hypergeometric series, interpolation, curved surfaces, and the projection of surfaces on maps, all of which, with others, are printed in the seven vols. of his collected works (Gött. 1863–71). Gauss died at Göttingen, 23d February 1855. See Lives

by Sartorius von Waltershausen (2d ed. 1877) and Winnecke (1877).

Gaussen, François S. R. Louis, a Swiss Reformed theologian, born at Geneva, 25th August 1790, was pastor at Satigny near Geneva, and took an active part in the church controversies of the time, until dismissed in 1831 by the State Council of Geneva, because he, with Merle d'Aubigné, had taken part in establishing the Société Evangélique, one object of which was the founding of a new theological school for the maintenance of the old Calvinism. From 1836 till his retirement in 1857 he lectured with success in the new college, and died at Les Grottes, Geneva, 18th June 1863. Of his writings may be named *La Théopneustie, ou Pleine Inspiration des Saintes Ecritures* (1840), a defence of plenary inspiration, which became popular in England and America; and *Le Canon des Saintes Ecritures au double point de vue de la Science et de la Foi* (1860).

Gautama. See Buddhism.

Gautier, Théophile, one of the most accomplished of recent French poets and prose writers, was born at Tarbes, August 31, 1811, and educated at the grammar-school of his native town, and afterwards at the Collége Charlemagne in Paris. He applied himself at first, but without much success, to painting, turned to literature, and attracted the notice of Sainte-Beuve at eighteen by the style of several essays, the results of his studies in the earlier French literature. He soon attached himself to the school of Victor Hugo, and outdid all the other romanticists in the extravagance of his admiration and partisanship. His belief in the 'poet of the wind, the sea, and the sky' was the one serious belief of his life. In 1830 he published his first long poem, *Albertus*, an extravagantly picturesque legend, full of the promise of his later flexibility of diction, followed in 1832 by the striking *Comédie de la Mort*. But his poetry did not reach its highest point till the *Émaux et Camées* (1856). In 1835 appeared his celebrated novel, *Mademoiselle de Maupin*, with its defiant preface, which was taken seriously by the critics, instead of being regarded as merely the escapade of an unscrupulously clever youth, and the advertisement of a publisher who wanted a 'sensational' novel. He wrote many other novels and shorter stories, the chief being *Les Jeune France* (1833), *Fortunio* (1838), *Une Larme du Diable* (1839), *Militona* (1847), *La Peau de Tigre* (1852), *Jettatura* (1857), *Le Capitaine Fracasse* (1863), *La Belle Jenny* (1865), and *Spirite* (1866). Mérimée alone contests with him the palm as the prince of writers of short stories. He was drawn early to the lucrative task of *feuilleton* writing, and for more than thirty years contributed to the Paris newspapers criticisms on the theatre and on the salon. The first half of his theatrical criticisms were collected in 1859 in 6 volumes, under the ambitious title of *L'Histoire de l'Art Dramatique en France;* his accounts of the Salon, which have yet to be republished, form perhaps the best history, if the least didactic, of the French art of his day. His leisure he devoted to travels in Spain, Holland, Turkey, England, Algeria, and Russia, of which he published characteristic accounts in his *Caprices et Zigzags*, *Constantinople*, *Voyage en Russie*, and *Voyage en Espagne*, admirable feats of description, relating solely to the look of the countries visited, not at all to their institutions, yet forming perhaps the most delightful books of travel in existence. Gautier died in Paris, October 23, 1872. Other works were an enlarged edition of his inimitable *Émaux et Camées* (1872); *Les Grotesques* (1844), on the writers of the 16th and 17th centuries; *Honoré de Balzac* (1858); *Ménagerie Intime* (1869), a kind of informal autobiography; *Histoire du Romantisme* (1872); and the posthumous works, *Portraits et Souvenirs Littéraires* (1875), and *L'Orient* (1877). Gautier's name has become a kind of watchword and battle-cry. Writers with more enthusiasm than good sense have made him an idol, and elevated the paradoxes of his scepticism into a theory of life, while the sturdy moralists of the press use his name as a synonym for everything in art that is effeminate, and for all the affectations of the boudoir poetaster. The truth is that Gautier was nothing greater or less than a consummate artist in prose and verse. He is neither moral nor immoral; has absolutely no fixed faith of any sort, except in the pleasantness of pleasant impressions, holding even his æsthetic principles with good-humoured laxity. His whole philosophy is a philosophy of paradox, his ideal of life hardly more than a picturesque viciousness. His besetting sin was a childish desire to say something clever and wicked to shock the Philistines. He himself never expected his lewd romance to be taken seriously, to be adopted as the gospel of a school, and characterised with grave absurdity as 'the golden book of spirit and sense.' See collections of reminiscences by Feydeau (1874) and Bergerat (1878); Henry James's *French Poets and Novelists* (1878); and the monograph by Maxime du Camp (1890).

Gauze, a light transparent silk fabric, supposed to have derived its name from having first been manufactured in Gaza, a city of Palestine. France and Switzerland produce large quantities. The openness of texture is obtained by crossing the warp threads between each thread of the weft, so that the weft passes through a succession of loops in the warp, and the threads are thus kept apart, without the liability to sliding from their places, which would take place if simple weaving were left so loose and open. It is used for dress purposes, and largely also for sifting flour. What is made for the latter purpose is sometimes called bolting-cloth. The cotton fabric leno has the same structure as gauze. Cheap textiles of the nature of gauze are used for the skirts of ballet-girls. For wire-gauze, see Safety-lamp, Wire.

Gavarni, Paul, a French caricaturist whose proper name was Sulpice Guillaume Chevalier, was born at Paris in 1801, and started life as a mechanical engineer. But, being a skilful draughtsman, he abandoned engine-making to become a caricaturist for *Les Gens du Monde*, and afterwards for *Le Charivari*. During the early part of his career he ridiculed the follies, vices, and habits of the citizens of Paris with a sort of good-humoured irony; but later in life a deeper earnestness, and sometimes even bitterness, showed itself in the productions of his pencil. This tendency was greatly strengthened by a visit to London in 1849, and from that date he reproduced in the newspaper *L'Illustration* the scenes of misery and degradation he had witnessed in the English capital. Gavarni also illustrated several books, the most notable being Sue's *Juif Errant*, Balzac's works, the French translation of Hoffmann's tales, &c. He died at Auteuil, near Paris, 23d November 1866. A collection of his drawings, engraved on wood, appeared at Paris, under the title of *Œuvres Choisies*, with text by Janin, Gautier, Balzac, and others (4 vols. 1845–48). This was followed by a second collection, *Perles et Parures* (2 vols. 1850).

Gavazzi, Alessandro, a popular Italian preacher and reformer, was born at Bologna in 1809. He became a monk of the Barnabite order, and was appointed professor of Rhetoric at Naples, where he speedily acquired great reputation as an orator. On the accession of Pius IX. to the papal chair, Gavazzi was one of the foremost supporters of the liberal policy that inaugurated that pontiff's

reign; and having repaired to Rome, he devoted himself to the diffusion of political enlightenment and patriotic aspirations among the masses of the Roman population. The pope sanctioned his political labours, and appointed him almoner of a body of 16,000 Roman troops. On the establishment of the republic at Rome, he was appointed almoner-in-chief to the national army. Under his superintendence, efficient military hospitals were organised. Rome having fallen, Gavazzi escaped to England, where he delivered addresses and lectures. He separated from the Catholic Church, and was for the rest of his life a strenuously anti-papal advocate. From Scotland the Italian orator proceeded to the United States, where he was rather coldly received; and when he went to Canada his public appearances, on more than one occasion, nearly caused a riot. Gavazzi was present with Garibaldi at Palermo during the expedition of 1860. He again visited London in 1870; and after that repeatedly visited England and Scotland, preaching and lecturing in aid of the (Protestant) Italian Free Church (*Libera Chiesa*), of which he was a prominent leader. He died 9th January 1889.

Gavelkind. The origin of this legal term is involved in some obscurity, and more than one derivation has been given. Lord Coke's opinion was that it was derived from *gave all kinde* (Teut. *gif eal cyn*), meaning the custom which gives right of succession in land to all children equally. The better opinion, however, seems to be that it is derived from the Saxon word *gavel* (or *gafol*), which signifies rent or customary services in lieu thereof, and *kind*—i.e. nature or quality. Thus gavelkind was used to express land which paid this kind of rent-service, as distinguished from the ordinary feudal tenure of knight-service. It is the opinion of Blackstone, endorsed by Skeat, that the true origin of this custom is Celtic (Irish, *gabhaidhcinn*), while some recent investigators as Elton in his *Origins of English History* (1881)—think that we must look for its source even farther back in pre-Aryan times.

Before 1066 gavelkind prevailed all over England and Wales (see Stephen's *Com.* i. 213), but with the Norman Conquest came feudal laws, and the right of primogeniture took its place. At the present day it survives only in the county of Kent and a few isolated places in England. It was specially abolished as regards Wales by 34 and 35 Henry VIII. chap. 26. In Kent, however, the custom is so universal that it is presumed by the courts of law to exist in any question affecting Kentish lands, and it is necessary in such case to plead that the lands have been disgavelled by special act of parliament. The reason why the county of Kent should have been permitted to retain this ancient tenure as one of its 'liberties,' in view of the almost universal introduction of feudal rules into the rest of England, is not clear. There is an explanation of a legendary character that William the Conqueror owed his life to some Kentish men, who immediately after the battle of Hastings surrounded him with boughs so as to form a sort of moving wood, and that he out of gratitude thereupon confirmed their ancient rights to them and their fellows.

The main characteristic of the tenure of gavelkind is that succession to the land passes in the right line to all the sons equally and not to the eldest son. Failing sons, it goes to all the daughters as heirs-portioners. Further, the right of representation takes place, so that, if one of several sons should die, his issue (daughters in this event equally with sons) take in his place. Succession in the collateral line is similar; for, if one brother die, the succession passes to all his brothers equally and their issue *jure representationis*. In addition to these peculiarities in the matter of succession, the following features of gavelkind tenure may be noticed: (1) A wife takes by way of dower one-half instead of one-third of the land, and a husband becomes tenant by courtesy of one-half of the land (whether issue have been born or not) so long as he remains unmarried; (2) the tenant is of age sufficient to make a contract or alienate his estate by feoffment at the age of fifteen; (3) the gavelkind lands did not formerly escheat in case of an attainder for felony, the maxim being 'the father to the bough, the son to the plough;' but all lands now stand in the same position in this respect (Williams, *On Real Property*, 130).

Gaveston, PIERS DE. See EDWARD II.

Gavial (*Gavialis*), a genus of reptiles of the Crocodile (q.v.) order, conspicuously differing from true crocodiles and from alligators in the great length and slenderness of the snout. The teeth are very numerous, about 120; they are more equal in size than those of the other animals of this order.

Gavial (*Gavialis gangeticus*).

The best-known species, *G. gangeticus*, inhabits the Ganges. It attains a length of 24 feet; but, owing to the slenderness of its snout, it is esteemed less dangerous than a true crocodile of smaller size. The gavial feeds chiefly on fishes and carcasses, and preys more casually upon mammals. A cartilaginous swelling at the extremity of the muzzle seems to have given rise to Ælian's statement that the crocodile of the Ganges had a horn at the tip of its snout. In some parts—e.g. Malabar, the gavial is held sacred, worshipped, and petted. A smaller species from Borneo and Java is distinguished as *G. schlegelii*. See CROCODILE.

Gavotte, a French dance of a lively yet dignified character. The name is said to be derived from the Gavots, the people of the *pays de Gap*. The music is in common time, moderately quick, and always begins on the third beat of the bar; each of the two sections of which it consists is usually repeated. It is frequently introduced in the suites (see SUITE) of the elder classical composers (Bach, &c.); and recent imitations of this and other old dances are so numerous as to become wearisome.

Gay, JOHN, the youngest son of William Gay of Barnstaple, was born in 1685. Although of an old family, his father was in reduced circumstances; and Gay, after being educated at the local grammar-school, was apprenticed to a London silk-mercer. Disliking this occupation, he soon abandoned it, and, having spent some months at home, returned to London to live by letters. In 1708 he published his first poem, *Wine*, in blank verse, and in 1711

an anonymous pamphlet, called the *Present State of Wit*. By this time he had made the acquaintance of Pope, to whom in 1713 he dedicated a georgic, *Rural Sports*. Late in the previous year he had been appointed secretary to the Duchess of Monmouth. In 1714 he brought out *The Fan*, and following this, *The Shepherd's Week*, a contribution to Pope's crusade against Ambrose Philips. Subsequently, resigning his post with the Duchess of Monmouth, he accompanied Lord Clarendon, then envoy to Hanover, as secretary. At Anne's death he was again in London, endeavouring to conciliate fortune by an epistle to the newly-arrived Princess of Wales. His next effort was the *What d'ye Call It?* 'a tragi-comi-pastoral farce' (1715). *Trivia*, a clever picture of town life from a pedestrian's point of view, for which Swift supplied hints, came next; and later he bore the blame of *Three Hours after Marriage* (1717), a play in which Pope and Arbuthnot had the larger part. In 1720 he published his poems by subscription, clearing £1000. With this his friends hoped he would have made some provision for the future, but it apparently vanished, as did also some South Sea stock which had been presented to him, in the crash of 1720. In 1724 he produced *The Captives*, a tragedy, and three years afterwards the first series of his popular *Fables*. But his greatest success was *The Beggar's Opera*, the outcome of a suggestion for a 'Newgate pastoral' made by Swift as far back as 1716. Its popularity was extraordinary; it ran sixty-two nights, gave celebrity to its actors, and, in the popular phrase, made Rich (the manager) gay, and Gay (the author) rich. By the thirty-sixth night he had netted between £700 and £800; and he forthwith set about a sequel, *Polly*, which was prohibited. This step only served to give the play a greater sale in book form, and the subscriptions brought Gay £1200. After this he lived chiefly with the Duke and Duchess of Queensberry, who since 1720 had been the kindest of his many patrons. In 1732 he came from their house to London, probably in connection with his opera of *Achilles* (produced in 1733), was seized with an inflammatory fever, and died in three days (4th December 1732). He was buried in Westminster Abbey 'as if he had been a peer of the realm.'

As a man Gay was amiable, indolent, and luxurious. His health was bad, and he wasted his life in vain hopes of preferment. But no man made kinder friends; and that he retained them is proof of his personal charm. His *Fables* have still a faint vitality; folklorists and antiquaries still study *Trivia* and *The Shepherd's Week*, and 18th-century specialists delight in the chronicle of his two ballad operas. On the whole, however, his poetical reputation has not been maintained. But he was a charming song-writer, and will perhaps last longest by his ballad of 'Black-eyed Susan.' The best portrait of him is by Kneller's pupil, William Aikman.

See the edition of the Poetical Works by Underhill (2 vols. 1893) and his edition of the Letters and Prose Writings (Muses Library).

Gaya, chief town of a district in Bengal, 57 miles S. of Patna by rail. It is a place of the greatest sanctity, from its associations with the founder of Buddhism, and is annually visited by about 100,000 Hindu pilgrims, who pray for the souls of their ancestors at the forty-five sacred shrines within and without the walls. In Gaya proper the Brahmans reside; adjoining is Sahibganj, the trading and official quarter. Six miles south is the village of Buddha-Gaya, the home of Buddha, with a famous temple and pipal tree (see BUDDHISM, p. 517). Joint pop. (1891) 80,383.—Gaya is also the name of the wine suburb of Oporto (q.v.).

Gayal (*Bibos frontalis*), a species of ox, which is found wild in the mountains of Aracan, Chittagong, Tipura, and Sylhet, and which has long been domesticated in these countries and in the eastern parts of Bengal. It is about the size of the Indian buffalo, is dark brown, and has short curved horns.

Gay-Lussac, LOUIS JOSEPH, chemist and physicist, was born 6th December 1778, at St Léonard (Haute Vienne). Entering the Polytechnic School in 1797, he was in 1801 promoted to the department of Ponts et Chaussées; and shortly afterwards Berthollet selected him as his assistant in the government chemical works at Arcueil. He now began a series of original researches on the dilatation of gases, the tension of vapours, the improvement of thermometers and barometers, the density of vapours, hygrometry, evaporation, and capillary action. Next, first with Biot, and a month later alone, he made two balloon ascents for the purpose of investigating the temperature and moisture of the air and the laws of terrestrial magnetism. Along with Alexander von Humboldt he analysed the properties of air brought down from a height of nearly 23,000 feet, and their joint memoir to the Academy of Sciences (read 1st October 1804) contained the first announcement of the fact that oxygen and hydrogen unite to form water in the proportion of one volume of the former to two volumes of the latter (see ATOMIC THEORY). This result induced him to study the combining volumes of other gases, and thus led him to the important discovery of the *law of volumes*, which was announced in 1808. A year later he was appointed professor of Chemistry at the Polytechnic School, and from 1832 also filled the corresponding chair in the Jardin des Plantes. Davy's discoveries of potassium and sodium, by the decomposing action of the voltaic pile, stimulated Gay-Lussac and Thénard to pursue this class of researches. The results appeared in their *Recherches Physico-chimiques* (2 vols. 1811). Amongst the most important of the discoveries announced in these volumes were a purely chemical process for obtaining potassium directly, the separation of boron from boracic acid, and new and improved methods of analysing organic compounds. (Boron was, however, simultaneously discovered in England by Davy.) Although the discovery of iodine (in 1811) is due to Courtois, Gay-Lussac shares with Davy the merit of having (in 1813) first described its distinctive properties, and proved that it is an elementary body; he was also the first to form synthetically the compounds of iodine with hydrogen and oxygen, known as hydriodic and iodic acids. In 1815 he succeeded in isolating the compound radicle Cyanogen (q.v.), the first known example of a compound body which will unite with elementary bodies in the same way as these unite with one another. Later in life he experimented upon fermentation, and in conjunction with Liebig made an examination of fulminic acid, and further improved the methods of organic analysis. From this time a good deal of his attention was given to the practical applications of chemistry. In this department his investigations regarding the manufacture of sulphuric acid (which led to the introduction of the Gay-Lussac tower, first erected by him for the recovery of waste oxides of nitrogen), his essays on the bleaching chlorides, his method of using the centesimal alcoholometer, and his improvements in assaying silver by the wet method by means of a standard solution of common salt, are the most important. In 1805 he was appointed a member of the Committee of Arts and Manufactures, established by the minister of Commerce, in 1818 superintendent of the government manufactory of gunpowder and saltpetre, and

in 1829 chief assayer to the mint. In 1839 he was made a peer of France. From the year 1816 he was the editor, in association with Arago, of the *Annales de Chimie et de Physique*. He died at Paris, 9th May 1850. As a chemist Gay-Lussac is distinguished by great accuracy, descriptive clearness, and undoubted genius. A complete list of his papers is given in the Royal Society's catalogue. His larger works, besides that already mentioned, include *Mémoires sur l'Analyse de l'Air Atmosphérique* (1804), *Cours de Physique* (1827), and *Leçons de Chimie* (1828).

Gaza (now called *Guzzeh*), one of the five chief cities of the ancient Philistines, situated in the south-west of Palestine, about three miles from the sea, on the borders of the desert which separates Palestine from Egypt. It is often mentioned in the history of Samson, and was the scene of constant struggles between the Israelites and the Philistines. In 333 B.C. it was taken after a five months' siege by Alexander the Great, and from that time down to 1799, when the French under Kleber captured it, it witnessed the victories of the Maccabees, the Calif Abu-bekr, the Templars, and the heroic Saladin. Constantine the Great, who rebuilt the town, made it the seat of a bishop. The modern Guzzeh is a scattered group of villages. Pop. 16,000.

Gaza, or GAZA-LAND, a large Portuguese territory in South-East Africa, between Sofala and the Transvaal. Much of the land is fertile; the inhabitants are Bantus.

Gaza, THEODORUS, Greek scholar, was born at Thessalonica in 1398, fled about 1444 before the Turks to Italy, where he became teacher of Greek at Ferrara, next of philosophy at Rome. After the death of Pope Nicholas V., King Alfonso invited him to Naples; but the death of this new patron two years later drove him back to Rome, where he was befriended by Cardinal Bessarion, who obtained for him a small benefice in Calabria. There he died in 1478. Gaza has been warmly praised by subsequent scholars, such as Politian, Erasmus, Scaliger, and Melanchthon. His principal work was a Greek grammar in four books, first published by Aldus Manutius at Venice in 1495. He translated into Latin portions of Aristotle, Theophrastus, St Chrysostom, Hippocrates, and other Greek writers.

Gazelle is a name given to some twenty different species of antelopes, which differ from each other principally in the form of curvature of the horns, in the presence or absence of horns in the female, and in the colour. The true gazelle (*Gazella Dorcas*) is a species about the size of a roebuck, but of lighter and more graceful form, with longer and more slender limbs, in these respects exhibiting the typical characters of the antelopes in their highest perfection. It is of a light tawny colour, the under parts white; a broad brown band along each flank; the hair short and smooth. The face is reddish fawn-colour, with white and dark stripes. The horns of the old males are 9 or 10 inches long, bending outward and then inward, like the sides of a lyre, also backward at the base and forward at the tips, tapering to a point, surrounded by thirteen or fourteen permanent rings, the rings near the base being closest together and most perfect. The horns of the female are smaller and obscurely ringed. The ears are long, narrow, and pointed; the eyes very large, soft, and black; there is a tuft of hair on each knee; the tail is short, with black hairs on its upper surface only, and at its tip. The gazelle is a native of the north of Africa, and of Syria, Arabia, and Persia. Great herds of gazelles frequent the northern borders of the Sahara; and notwithstanding their great speed, and the resistance which they are capable of making when compelled to stand at bay—the herd closing together with the females and young in the centre, and the males presenting their horns all around—lions and panthers destroy them in great numbers. The speed of the gazelle is such that it cannot be successfully hunted by any kind of dog, but in some parts of the East it is taken with the assistance of falcons of a small species, which fasten on its head, and by the flapping of their wings blind and confuse it, so that it soon falls a prey to the hunter.

Gazella Granti.

It is also captured in enclosures made near its drinking-places. Although naturally very wild and timid, it is easily domesticated, and, when taken young, becomes extremely familiar. Tame gazelles are very common in the Asiatic countries of which the species is a native; and the poetry of these countries abounds in allusions both to the beauty and the gentleness of the gazelle.—Some confusion has arisen among naturalists as to the application of the name gazelle, originally Arabic; and it has not only been given to the *leucoryx* of the ancients, a very different species, but even to the *gemsboc* of South Africa. The true gazelle was known to the ancients, and is accurately described by Ælian under the name *dorcas*, which was also given to the roe.

Gazette, an abstract of news, a newspaper. The word is derived, through the medium of French, from Italian *gazzetta*, 'a gazette,' which may have been originally a mere diminutive of *gazza*, 'magpie,' with the sense of 'gossip, tittle-tattle;' or, with greater likelihood, *gazzetta*, 'a small coin' (Gr. *gaza*, 'a treasury,' a word ultimately of Persian origin), the sum charged for a reading of the first Venetian newspaper, which appeared about 1536. The *London Gazette* is an official organ, the property of the government. It was founded in 1665, and appears twice a week. It is recognised by law as the medium of official and legal announcements, as also of many intimations with regard to private transactions which are required by law to be thus published, such as trust-deeds for creditors. Similar official gazettes are published at Edinburgh and Dublin. To be 'put in the gazette' is in Britain a popular synonym for becoming bankrupt.

Gazetteer is in modern English a geographical or topographical dictionary, or alphabetical arrangement of place-names, with a more or less abundant complement of information, descriptive, statistical, and historical. The word (like the corresponding French *gazétier*) was familiar in the 18th century in the sense of a writer in the gazettes or newspapers. That industrious compiler, Laurence Echard or Eachard, published in 1703 *The Gazet-*

teer's or Newsman's Interpreter, being a geographical index of all the considerable Cities, Patriarchships . . . Ports, Forts, Castles, &c. in Europe. 'The Title,' he says, 'was given me by a very eminent person whom I forbear to name.' In the preface to the second part (1704), relating to Asia, Africa, and America, he refers to his book briefly as *The Gazetteer*. Other compilers soon adopted the convenient abbreviation. The word was new, but the thing was of ancient date: e.g. we still have considerable fragments of the 6th century geographical dictionary of Stephanus Byzantius.

General Gazetteers. The ideally perfect gazetteer would be one in which every place name in the world was registered and its history recorded. To any one who knows what this would mean, the most extensive 'Universal' gazetteer must appear amusingly meagre. The following are among the noteworthy works of general scope: Ferrarius, edited by Baudrand (fol. Paris, 1670); Bryce of Exeter, *Univ. Geog. Dict. or Grand Gazetteer* (2 vols in 1, fol. Lond. 1759: a remarkable bit of work); Brooke (8vo, Lond. 1778; 16th ed. 1815); Walker, edited by Cappe (8vo, Lond. 1815); Cruttwell (1798), afterwards incorporated in the *Edinburgh Gazetteer* (1 vol. 1822; 2d ed. 6 vols. 1829); Landmann (8vo, Lond. 1835); Macculloch (1841-42); Thomson (8vo, Edin. 1842); Fullarton (25,000 names; 7 vols. Edin. 1850); Blackie's *Imperial* (2 vols. Glasgow, 1850); Johnston (1850; new ed. 1877); Lippincott, *Pronouncing Gaz. of the World* (Phila. 1865; new ed., with 125,000 places, 1880); Bouillet, *Dict. d'Hist. et de Géog.* 1857); Knight's *Encyclopædia* (geog. division); Ritter's *Geog.-stat. Lexikon* (2 vols. Leip. 1874, edited by Henne am Rhyn; new ed. by Lagai, 1883); Saint-Martin (4to, Paris, 1875 *et seq.*); Oliver and Boyd (8vo, Edin. 1880); *Chambers's Concise Gazetteer of the World* (8vo, 1895); *Longmans' Gazetteer of the World*, edited by G. T. Chisholm (4to, London, 1895).

Special Gazetteers.

America (North).—*American Gazetteer* (3 vols. Lond. 1762); Thomson (4to, Lond. 1812); Davenport (8vo, New York, 1842); Kidder (Burley's, 8vo, Phila. 1876); Colange, *U.S. Gazetteer* (8vo, Cincinn. 1884).

Ancient Geography.—Echard (12mo, Lond. 1715); Macbean (8vo, Lond. 1773); Adam (8vo, Edin. 1795); Smith (2 vols. 8vo, 1852-57).

Australia.—Gordon & Gotch's *Australasian Handbook, incorporating New Zealand, &c.*

Austria-Hungary.—Umlauft, *Geog. Namenbuch* (1885), and local lexicons issued by Statistical Commission.

British Empire.—Macculloch (1837); Knight (2 vols. 8vo, Lond. 1853).

Commercial.—Peuchet (6 vols. 4to, Paris, 1800); Macculloch (8vo, Lond. 1832; new ed. 1882).

Egypt (Ancient).—Brugsch (Leip. 1877-80).

England.—William Lambard (born 1536), the writer of the first county history, is also the author of the first gazetteer of England, though the work did not appear in print till 1730. A *Book of the Names of all Parishes, &c.* (4to, Lond. 1657); John Adams, *Index Villaris* (fol. Lond. 1680); Whatley, *England's Gazetteer* (3 vols. 12mo, Lond. 1751); Luckombe (3 vols. 12mo, Lond. 1790); Carlisle (2 vols. 4to, Lond. 1808); Capper (8vo, Lond. 1808); Gorton (3 vols. 8vo, Lond. 1831-33); Ball (8vo, Glasgow, 1832); Cobbett (8vo, Lond. 1832); *Parliamentary Gazetteer* (4 vols. 4to, Lond. 1842); Lewis (7th ed. 4 vols. 4to, Lond. 1849); Dugdale & Blanchard (8vo, Lond. 1860); Wilson (2 vols. 8vo, Edin. 1866-69).

France.—Few countries, if any, are more thoroughly gazetteered than France. It is enough to mention Gindre de Nancy (1874), Joanne (3d ed. 1886), and the great series of departmental gazetteers brought out by the ministry of Public Instruction (1861, &c.).

Germany.—Neumann, *Geographisches Lexikon des Deutschen Reiches* (Leip. 1885).

Great Britain.—Sharp (2 vols. Lond. 1863); Hamilton (3 vols. 4to, Lond. 1868); Beeton (8vo, Lond. 1870); Bartholomew (60,000 names, 8vo, Edin. 1887); Cassell (Lond. 1893 *et seq.*); Mackenzie (Glasgow, 1893 *et seq.*).

India.—Hamilton (8vo, Lond. 1815); Thornton, *Gaz. of the Countries adjacent to India on the N.W.* (2 vols. 1844); Thornton, *Gaz. of the Territories under the E. I. Company* (4 vols. 1854; 1 vol. 1857, new ed. by Sir Roper Lethbridge and A. N. Wollaston, 8vo. 1886); Hunter, *Gaz. of India* (20 vols. 8vo, 1875-77; 2d ed. 1885-87). Numerous gazetteers for the several states have been compiled at the cost of the government; some of them, as that on Afghanistan, are hardly obtainable.

Italy.—Zuccagni Orlandini, *Corografia* (15 vols. 1844, &c.); Repetti, *Diz. della Toscana* (6 vols. Flor. 1833-46); Amati (8 vols. Flor. 1868, &c.); Altavilla (8vo, Turin, 1875).

Ireland.—Seward (12mo, Dublin, 1789); Carlisle (4to, Lond. 1810); Lewis (4to, Lond. 1837); Lawson (12mo, Edin. 1842); *Parliamentary Gazetteer* (3 vols. 8vo, Lond. 1844-46); Leggatt (8vo, Lond. 1879).

Russia.—Semenoff, in Russian (1862-86).

Scotland.—Macpherson, *Geographical Illustrations of Scottish History, containing the names mentioned in Chronicles*, &c. (4to, Lond. 1796); *Gazetteer* (8vo, Dundee, 1803; 2d ed. Edin. 1806); Carlisle (2 vols. 4to, Lond. 1813); Webster (8vo, Edin. 1817); Chambers (8vo, Edin. 1832); *Topographical . . . Gazetteer* (2 vols. 4to, Glasgow, 1842); *Comprehensive Gazetteer* (12mo, Glasgow, 1846); Wilson (2 vols. 8vo. Edin. 1854-57); *Ordnance Gaz.* (edited by F. H. Groome, 3 vols. 8vo, Edin. 1882-85; new ed. Glasgow, 1893).

Spain.—Madoz (1846-50), Mariana y Sanz (1886).

Sweden.—*Hist.-geog. Lex.* (8vo, 7 vols. Stockholm, 1859-66); Rosenberg (1881-83).

Switzerland.—Weber (3d ed. 1886).

Compare articles on the several countries.

Gazogene. See Aerated Waters.

Gearing, a term applied to the machinery which communicates motion from one part of a machine to another, and may consist of toothed-wheels, endless bands, &c. When the communication is interrupted, it is *out of gear*; and when restored, *in gear*. *Straight gearing* is used when the planes of motion are parallel; *bevelled gearing*, when the direction is changed. Gearing may also be 'multiplying' or retarding, i.e. increasing or diminishing the original velocity.

Gebhardt, Oskar von, was born at Wesenberg in Esthonia, 22d June 1844, studied theology at Dorpat, Tübingen, Erlangen, Göttingen, and Leipzig, and since 1875 has been engaged as a librarian at Strasburg, Leipzig, Halle, Göttingen (1880), and Berlin (1884). He has edited *Patrum Apostolicorum Opera* (with Harnack and Zahn; 3 vols. Leip. 1875-78), *Evangeliarum Codex Rossanensis* (with Harnack; 1880), and *Texte und Untersuchungen zur Geschichte der altchristlichen Litteratur* (with Harnack; vols. i.-v. 1883-88). Since 1881 he has re-edited Tischendorf's text of the New Testament.

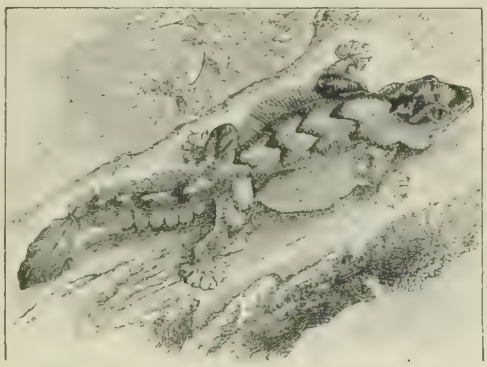
Gebir, or Geber. Under this name are current several works on alchemy and chemistry. The history of the real author is so shrouded in mystery that his existence has been denied, and Gebir looked upon as a mythical personage. He is usually identified with Jabir ibn Haijan, a celebrated Arabic alchemist in the 8th century. His birthplace is given differently as Harran in Mesopotamia, Tarsus, and Kufa; he is said to have resided at Damascus and Kufa, and to have died in 776. The principal writings which go under the name of Gebir, are *Summa Perfectionis* (see Alchemy); *Summa Collectionis Complementi Secretorum Naturæ*; *Testamentum*; *Liber Investigationis*; and two tractates on spherical triangles and astronomy.

Gebirol, or Gabirol. See Avicebron.

Gebweiler (Fr. *Guebwiller*), a town of Alsace-Lorraine, at the foot of the Vosges, 15 miles SSW. of Colmar, has a 12th-century church, cotton-spinning and weaving, dye-works, machine-factories, and vineyards. Pop. (1890) 12,300.

Gecko, a group of lizards constituting a family, Geckotidæ, which have been divided into a large number of genera, including more than 200 species. The geckos are of small size, the colours of most of them are dull, and the small granular scales with which they are covered are in general

mingled with tubercles. The legs are short, the gait usually slow, measured, and stealthy, although geckos can also run very nimbly when danger presses, and often disappear very suddenly when they seem almost to be struck or caught. The feet are remarkable, being adapted for adhering to smooth surfaces, so that geckos readily climb the smoothest trees or walls, or creep inverted on ceilings, or hang on the lower side of the large leaves in which tropical vegetation abounds. The body and tail are never crested, but are sometimes furnished with lateral membranes, variously festooned or fringed. The lateral membrane is sometimes even so large as to be of use to arboreal species in enabling them to take long leaps from branch to branch. The geckos feed chiefly on insects. They are more or less nocturnal in their habits. They are natives of warm climates, and



Fringed Gecko (*Ptychozoon homalocephalum*).

are very widely distributed over the world, being especially numerous in the Indian and Australian regions. Two species are found in the south of Europe, both of which frequently enter houses, as do the geckos of Egypt, India, and other warm countries. The name gecko is derived from a peculiar cry often uttered by some of the species, and which in some of them resembles syllables distinctly pronounced, whilst others are described as enlivening the night in tropical forests by a harsh cackle. The geckos have, in almost all parts of the world where they are found, a bad reputation as venomous, and as imparting injurious qualities to food which they touch; but there is no good evidence in support of any such opinion, in accordance with which, however, an Egyptian gecko is even known as 'the father of leprosy.'

Ged, WILLIAM, inventor of the art of stereotyping, was an Edinburgh goldsmith, born in 1690, who from 1725 onwards bent his energies to the Stereotyping (q.v.) of books. He entered into partnership with a London capitalist, and was commissioned by the university of Cambridge to stereotype some prayer-books and bibles, though only two prayer-books were actually finished; for, owing to the unfair treatment of his partner and the injustice of his own workmen, Ged was compelled to abandon the enterprise. He returned to Edinburgh a disappointed man, and died there on 19th October 1749. His most noteworthy production after his return home was a stereotyped edition of Sallust (1739). See *Memoir* by Nichols (1781).

Geddes, ALEXANDER, a biblical critic, translator, and miscellaneous writer, was born at Arradowl, in the parish of Ruthven, Banffshire, in 1737. His parents were Roman Catholics, and he was educated for a priest, first at Scalan, a monastic seminary in the Highlands, next at the Scots College, Paris, where he acquired a knowledge of Hebrew, Greek, Italian, French, Spanish, German, and Dutch. In 1764 he returned to Scotland, and five years later took a cure of souls at Auchinhalrig in Banffshire, where he remained for ten years. Here he made himself conspicuous by a breadth of sympathy with the Protestants around him, so extraordinary as to lead to his being deposed from all his ecclesiastical functions. The university of Aberdeen made him LL.D. Geddes now resolved to betake himself to literature, and proceeded to London in 1780. He had long planned a translation of the Bible into English for the use of Roman Catholics, and he was now, through the munificence of Lord Petre, enabled to devote himself to the work. The first volume appeared in 1792; the second in 1793, carrying the translation as far as the end of the historical books; and the third was issued in 1800, containing his *Critical Remarks on the Hebrew Scriptures*. These volumes, especially the last, are startlingly heretical, and offended Catholics and Protestants alike. They exhibit as thorough-going Rationalism as is to be found in Eichhorn or Paulus, eliminating the supernatural element from the Scriptures; such stories as that of the Creation in Genesis being merely poetical or philosophical fictions, and such figures as Moses merely men who by a pious fraud contrived to add a divine sanction to mere human wisdom. These opinions naturally enough exposed Geddes to the charge of infidelity. He died in London, 26th February 1802. His poems, even *Bardomachia*, are now of no importance. See the Life by Dr Mason Good (1803).

Geddes, ANDREW, a painter, was born at Edinburgh in 1783. He began to study at the Royal Academy in London in 1806, and first exhibited in Edinburgh, producing successful pictures in 1808 and in 1810, in the latter year the 'Draught-players.' This, along with 'The Discovery of the Scottish Regalia,' exhibited at the Royal Academy, London, in 1821, and 'Christ and the Woman of Samaria,' are esteemed his best pictures, though he also excelled in portrait-painting. He ranks higher as an etcher. In 1831 he was elected A.R.A., and died in 1844.

Geddes, JENNY, an obscure woman whose name is memorable in tradition from her having begun the riotous resistance to the introduction of a Service-book prepared by Laud into the Church of Scotland in 1637. The day fixed for this hated innovation was Sunday the 23d July, and an immense crowd filled the High Kirk of St Giles, Edinburgh, on the occasion. On Dean Hanna's beginning to read the collect for the day, Jenny Geddes, who kept a vegetable-stall in the High Street, threw her stool at his head, shouting: 'Deil colic the wame o' thee; out, thou false thief! dost thou say mass at my lug?' A great uproar at once arose, and both dean and bishop (David Lindsay) had to flee for their lives from the fury of the mob. This tumult proved the deathblow of the liturgy in Scotland. This famous exploit is unfortunately lacking in historical evidence beyond a fairly early and persistent tradition. Still Sydserf in 1661 mentions 'the immortal Jenet Geddes, princess of the Trone adventurers,' as having burned 'her leather chair of state'—evidently an object already famous—at the Restoration bonfires, and the story appears with name and full detail in Phillips' *Continuation of Baker's Chronicle*, published in 1660, the heroine being stated as 'yet living at the time of this relation.' An idle attempt has been made to set up a rival claimant in one Barbara Hamilton or Mein, but Jenny Geddes still

keeps her place among the *worthies* of Scottish history. The credulous may even see her stool in the Antiquaries' Museum at Edinburgh. See Dr Lees's *St Giles', Edinburgh* (1889).

Gedrosia. See Beluchistan.

Geelong, a city of Victoria, is picturesquely situated on the south side of Corio Bay, 45 miles SW. of Melbourne by rail. It is well laid out, abounds in attractive shops, and has some handsome buildings. The river Barwon forms the southern boundary of the city, and 3 miles farther spreads into the Connewarre Lakes, falling into the sea at Point Flinders. The gold discoveries in 1851 added to the prosperity of Geelong, which had been incorporated as a town in 1849, and became a principal seat of the wool trade—the first woollen mill in Victoria being erected in Geelong. Alongside of the railway jetty the largest ships can load and discharge, and there are three other jetties for smaller vessels. Through the bar at the entrance to Corio Bay a channel has been dredged for the convenience of steamer traffic. The district is exceedingly fertile; the Barrabool Hills on the west bank of the Barwon are covered with farms and orchards, but the vineyards have been destroyed under the Phylloxera Act. Limestone and a kind of marble are found in the neighbourhood. There are various industries carried on, especially the manufacture of woollen cloths and paper, meat-preserving, tanning, rope-making, fishing, &c. The Exhibition Hall and general produce exchange, theatre, and assembly rooms combined, stands in the market-square. The city is lighted with gas; is supplied with water from Stony Creek reservoirs and the river Moorabool; and has two parks, botanical gardens, government buildings, a town-hall, a new post-office (1889), an excellent hospital, a chamber of commerce, mechanics' institute, grammar-school, and five newspapers. Corio Bay is a favourite bathing-resort; and on the eastern boundary of the town are extensive limestone quarries. Pop., including the suburbs, (1871) 22,618; (1891) 24,283, of whom 10,000 were within the municipal boundary.

Geelvink Bay penetrates 125 miles southward into the western arm of New Guinea. Its entrance, some 155 miles wide, is protected by several islands; its shores are well wooded, flat, and fertile, but unhealthy. The bay is separated by a narrow isthmus from the Alfura Sea on the south, and by a still narrower isthmus from M'Clure Gulf on the west.

Geestemünde, a seaport of Prussia, situated at the confluence of the Geeste with the Weser, immediately SE. of Bremerhaven, owes its importance to the docks and wharves constructed in 1857–63. It has also a school of navigation; imports petroleum, tobacco, rice, coffee, timber, and corn; and carries on various industries connected with shipping. Pop. 15,452.

Geez, or Ge'ez. See Ethiopia.

Gefle, chief town of the Swedish län of Gefleborg, is situated on an inlet of the Gulf of Bothnia, 71 miles by rail N. by W. of Upsala. The port for Dalecarlia, Gefle ranks third among the commercial towns of Sweden, coming next to Stockholm and Gothenburg. Among the noteworthy buildings are the castle (16th and 18th century) and the town-hall. Gefle, which has been rebuilt since its destruction by fire in 1869, has a school of navigation, and carries on shipbuilding, the manufacture of sail-cloth, cotton, and tobacco, and fisheries. It carries on an active trade, the principal exports being iron, timber, and tar; whilst its imports consist chiefly of corn and salt. Pop. (1874) 16,787; (1894) 25,255.

Gegenbaur, Karl, German comparative anatomist, was born on 21st August 1826, at Würzburg, where he was educated, and where he taught until 1855. In this year he was called to a medical professorship at Jena, but from 1858 to 1873 he taught principally anatomy. Removing to Heidelberg in 1873, he has since that date continued to lecture on the same subject. His fame rests upon his *Grundriss der vergleichenden Anatomie* (2d ed. Leip. 1878), which was translated into English that same year by F. J. Bell and E. Ray Lankester. Besides this he has published *Lehrbuch der Anatomie des Menschen* (1883; 5th ed. 1892), and since 1875 has edited the *Morphologisches Jahrbuch*.

Gehenna, the Greek form of the Hebrew *Gehinnom*, or Valley of Hinnom. This valley, or rather narrow gorge, lies south and west of the city of Jerusalem. Here Solomon built a high place for Moloch (1 Kings, xi. 7), and indeed Gehenna seems to have become a favourite spot with the later Jewish kings for the celebration of idolatrous rites. It was here that Ahaz and Manasseh made their children pass through the fire 'according to the abomination of the heathen;' and at its south-east extremity, specifically designated Tophet ('place of burning'), the hideous practice of infant sacrifice to the fire-gods was not unknown (Jeremiah, vii. 31). When King Josiah came forward as the restorer of the old and pure national faith he 'defiled' the Valley of Hinnom by covering it with human bones, and after this it appears to have become 'the common cesspool of the city, into which its sewage was conducted to be carried off by the waters of the Kidron, as well as a laystall, where all its solid filth was collected. Hence, it became a huge nest of insects, whose larvæ or "worms" fattened on the corruption.' It is also said that fires were kept constantly burning here to consume the bodies of criminals, the carcasses of animals, and whatever other offal might be combustible. Among the later Jews *Gehenna* and *Tophet* came to be symbols for hell and torment, and in this sense the former word is frequently employed by Jesus in the New Testament—e.g. Mark, ix. 47, 48.

Geibel, Emanuel von, one of the most popular of modern German poets, was born at Lübeck on 18th October 1815. After his studies at Bonn he lived at Berlin, in the poetical circle of Chamisso, Gaudy, and Kugler; next went to Athens in 1838 as tutor in the family of the Russian ambassador, but returned to Lübeck two years later to work up the material he had collected in Greece, and to pursue his studies in Italian and Spanish literature. At the beginning of 1843 a pension of 300 thalers was bestowed upon him by the king of Prussia. Geibel now resided alternately at St Goar with Freiligrath, at Stuttgart, Hanover, Berlin, and Lübeck, till in 1852 he was appointed professor of Æsthetics in the university of Munich by the king of Bavaria—a post he retained till 1868, when he retired to Lübeck. He contributed translations from the Greek poets to the *Classische Studien* of Ernst Curtius (1840), and in the same year published his own *Gedichte* (120th ed. 1893), the beauty and religious tone of which made them at once great favourites with the Germans. The results of his Spanish studies were the *Spanische Volkslieder und Romanzen* (1843), which were followed by the *Spanisches Liederbuch* (1852), published in conjunction with Paul Heyse. In 1857 appeared his tragedy of *Brunchild*, and in 1864 his *Gedichte und Gedenkblatter*. In 1868 he published another tragedy called *Sophonisbe*. He died at Lübeck, 6th April 1884. His poems are distinguished by fervour and truth of feeling, richness of fancy, and a certain pensive melancholy, and have procured

him a popularity—especially among cultivated women—such as no poet of Germany has enjoyed since the days of Uhland. An edition of his *Gesammelte Werke* was published at Stuttgart in 8 vols (1883 *et seq.*). See Lives by Gaedertz (1885) and Litzmann (1887).

Geiger, ABRAHAM, a Jewish scholar, was born at Frankfort-on-the-Main, May 24, 1810. According to old rabbinical practice, his teachers were his father and elder brother, till he reached the age of eleven. After that he went to the gymnasium, next to the universities of Heidelberg and Bonn, devoting himself to philosophy and the oriental languages. His prize essay, *Was hat Mohammed aus dem Judenthum aufgenommen?* was published in 1833. In November 1832 he was called as rabbi to Wiesbaden, and there he devoted himself with great zeal and in a scientific spirit to Jewish theology, especially in its relation to practical life. In 1835 he joined with several able scholars in starting the *Zeitschrift fur Judische Theologie*. In 1838 he was called as second rabbi to Breslau, and here he came into serious conflict with the more conservative Jews, but carried with him all men of learning and thought. From 1863 he officiated as rabbi at Frankfort, whence he was called in 1870 to Berlin. Here he died, 23d October 1874, editing from 1862 till the last the *Jüdische Zeitschrift*. Of his many books may be named his striking *Urschrift und Uebersetzungen der Bibel* (1857), and the elaborate history, *Das Judenthum und seine Geschichte* (1864–65). An *Allgemeine Einleitung*, and 5 vols. of *Nachgelassene Schriften*, were edited by his son in 1875. See his Life by Screiber (Löbau, 1880).

Geiger, LAZARUS, philologist, was born at Frankfort, 21st May 1829, studied at Bonn, Heidelberg, and Würzburg, and in 1861 became a teacher in the Jewish school at Frankfort. He died 29th August 1870. He wrote much on the relation of language and thought, affirming that without language man must have been without reason. His principal works are *Sprache und Vernunft* (1868–72), and *Ursprung der Sprache* (1869; 2d ed. 1878). See Lives by Peschier (1871) and Rosenthal (1883).

Geijer, ERIC GUSTAF, Swedish historian, was born at Ransäter, in Vermland, January 12, 1783. He was sent at sixteen to the university of Upsala, and in 1803 gained the prize awarded by the Academy of Stockholm for the best essay on the Swedish administrator, Sten Sture. From this period he devoted himself to the study of the history of his native country. Beginning to lecture at Upsala in 1810, he was shortly afterwards nominated to a post in the office of the National Archives; in 1815 he was elected assistant-professor, and in 1817 professor of History at Upsala. Geijer exercised a marked influence on the poetic no less than on the historical literature of Sweden. As early as 1810 he, along with several friends, founded the Gothic Society, in whose magazine, the *Iduna*, first appeared several of Geijer's best poems, and the early cantos of Tegnér's *Frithiof*. Great as is the value of Geijer's historical works, he unfortunately did not complete any one of the vast undertakings which he planned. Thus, of the *Svea Rikes Hafder*, or Records of Sweden (1825), which were to have embraced the history of his native country from mythical ages to the present time, he finished only the introductory volume. This, however, is a thoroughly good critical inquiry into the sources of legendary Swedish history. His next great work, *Svenska Folkets Historia* (3 vols. 1832–36), was not carried beyond the death of Queen Christina. To Geijer was entrusted the task of examining and editing the papers which Gustavus III. had bequeathed to the university of Upsala with the stipulation that they were not to be opened for fifty years after his death. They appeared in 1843–46. Geijer died at Stockholm, 23d April 1847. Of his other historical and political works we need only mention specially *The Condition of Sweden from the Death of Charles XII. to the Accession of Gustavus III.* (1838), and *Feudalism and Republicanism* (1844). Besides these he edited the continuation of Fant's *Scriptores Rerum Succicarum Medii Ævi* (1818–25), and Thorild's *Samlade Skrifter* (1819–25), and, along with Afzelius, a collection of *Svenska Folkvisor* (1814–16). During the last ten years of his life Geijer took an active part in politics; but, although his political writings possess great merit, the very versatility of his powers diverted him from applying them methodically to the complete elaboration of any one special subject. He was also known to his countrymen as a musician and composer of no mean order. His collected works were published by his son, with a biographical sketch (13 vols. 1849–56: new ed. 1873–75).

Geikie, SIR ARCHIBALD, geologist, born at Edinburgh in 1835, and educated at the High School and university. In 1855 he was appointed to the Geological Survey; in 1867 became director to the Survey in Scotland; from 1870 to 1881 was Murchison Professor of Geology in Edinburgh University; and in 1881 was appointed director-general to the Survey of the United Kingdom, being at the same time placed at the head of the Museum of Practical Geology, London. He is the author of *Story of a Boulder* (1858); *Phenomena of the Glacial Drift of Scotland* (1863); *The Scenery of Scotland viewed in connection with its Physical Geology* (1865; 2d ed. 1887); *Memoir of Sir R. Murchison* (1874); a *Text-book of Geology* (1882); *The Ancient Volcanoes of Great Britain* (1897); *The Founders of Geology* (1897); besides numerous class-books, primers, &c. on geology. He was knighted in 1891.—His brother JAMES was born at Edinburgh in 1839, and educated there. Having served on the Geological Survey of Scotland from 1861 to 1882, he succeeded Archibald as Murchison Professor of Geology in Edinburgh University. He is the author of *The Great Ice Age in its Relation to the Antiquity of Man* (1874; 3d ed. 1894); *Prehistoric Europe* (1881); *Outlines of Geology* (1886; 2d ed. 1888); a translation of *Songs and Lyrics by H. Heine and other German Poets* (1887); besides a large number of geological maps, sections, and memoirs published by the Geological Survey; and he has written the geological articles for the present edition of this work. He became F.R.S.E., 1871; F.R.S., 1875; LL.D. (St Andrews), 1877; D.C.L. (Durham), 1889; and is a Fellow of many learned societies at home and abroad.

Geiler von Kaisersberg, JOHANNES, a famous pulpit-orator of Germany, was born at Schaffhausen, 16th March 1455, studied at Freiburg and Basel, and in 1478 became preacher in the cathedral of Strasburg, where he died, 10th March 1510. Geiler von Kaisersberg was one of the most learned and original men of his age; his sermons, usually composed in Latin and delivered in German, are marked by great eloquence and earnestness, nor do they disdain the aids of wit, sarcasm, and ridicule. Of his writings, which have now become very rare, may be mentioned *Das Narrenschiff* (Lat. 1511; Ger. by Pauli, 1520), comprising 142 sermons on Sebastian Brandt's *Narrenschiff*; *Das Irrig Schaf* (1510); *Der Seelen Paradies* (1510); *Das Schiff der Pönitenz und Busswirkung* (1514); *Das Buch Granatapfel* (1511); *Christliche Pilgerschaft zum Ewigen Vaterland* (1512); and *Das Evangelienbuch* (1515). See the studies by

Ammon (Erl. 1826), Dacheux (Paris and Strasb. 1876), and Lindemann (Freiburg, 1877).

Geissler Tubes. See VACUUM TUBES.

Gela, an ancient city on the southern coast of Sicily, near the site of the modern Terranuova. It was founded by a colony of Rhodians and Cretans, 690 B.C., and grew so rapidly that as early as 582 it was able to found a colony at Agrigentum, which was soon to outstrip Gela itself (see GELON). Here Æschylus died and was buried, 456 B.C., and here Apollodorus was born. In 280 its inhabitants were transplanted to Phintias.

Gelasius, the name of two popes. GELASIUS I., an African by birth, succeeded Felix III. in 492, and was one of the earliest bishops of Rome to assert the supremacy of the papal chair, not only over temporal authority, but also over general councils of the church. He vigorously repressed Pelagianism, which was spreading in Dalmatia, renewed the ban of his predecessor against the oriental patriarch, drove out the Manichæans from Rome, and died in 496. There are extant a treatise of his against the Eutychians and Nestorians, *De duabus in Christo naturis*, several letters, and a *Codex Sacramentarius*. GELASIUS II., formerly John of Gaeta, was educated at the Benedictine abbey of Monte Cassino, was cardinal and chancellor under Urban II. and Paschal II., and on the death of the latter in the June of 1118 was chosen pope by the party hostile to the Emperor Henry V. The imperial party at Rome under the Frangipani seized his person, but were forced to set him free by the menacing attitude of the mob. The new pope fled before the advancing imperial troops to Gaeta, where he first received his consecration, and whence he fulminated the thunders of excommunication against Henry V. and Gregory VIII., the antipope he had set up. Soon after he was able to return to Rome, but ere long had to betake himself for protection to France, where he died in the monastery of Cluguy, early in 1119.

Gelatine, in Chemistry. Little is yet definitely known of the chemical nature of gelatine. It consists approximately of carbon 49·6, oxygen 25·4, nitrogen 18·3, and sulphur about 0·1 per cent. It is soluble in hot water, in acetic acid, and in cold sulphuric acid, and is insoluble in alcohol, ether, and other organic liquids; the aqueous solution is precipitated by tannic acid, chrome alum, and corrosive sublimate, but not by most acids, salts, or alkalies in dilute solution. Gelatine may be purified by dissolving it in water and pouring the solution into a large bulk of alcohol; the clot which forms consists of nearly pure gelatine, containing only a trace of ash. By dry distillation gelatine yields a quantity of carbonate of ammonia, and a foul smelling brown oil containing carbonate, sulphide and cyanide of ammonia, aniline, methylamine, picaline, and a number of pyridine bases. Gelatine solution dissolves lime and calcium phosphate much more freely than cold water, forming with the latter a definite compound, which probably forms part of the tissue of bones.

In Technology, the term gelatine, although usually applied to only one variety of the substance obtained by dissolving the soluble portion of the gelatinous tissues of animals, nevertheless properly belongs also to Isinglass (q.v.) and Glue (q.v.), which are modifications of the same material. Vegetable jelly is also analogous. Gelatine and glue signify the more or less pure and carefully prepared jelly of mammalian animals; but the term isinglass is only applied to certain gelatinous parts of fishes, which from their exceeding richness in gelatine, are usually merely dried and used without any other preparation than that of minute division for the purpose of facilitating their action.

Gelatine proper is prepared for commercial purposes from a variety of animal substances, but chiefly from the softer parts of the hides of oxen and calves and the skins of sheep, such as the thin portion which covers the belly, the ears, &c.; also from bones and other parts of animals. One of the best, if not the best of the varieties of gelatine manufactured in Great Britain, is the 'sparkling gelatine' of Messrs Cox of Gorgie, near Edinburgh, which is remarkable for its great purity and strength, or gelatinising power, and is purified by processes patented by them. The materials they use are carefully selected portions of ox only imported from South America. Another preparation, made by Mackay of Edinburgh from calves'-feet, is deserving of special mention.

The general method adopted with skin-parings or hide-clippings is first to wash the pieces very carefully; they are then cut into small pieces and placed in a weak solution of caustic soda for a week or ten days. When this process of digestion has been sufficiently carried on, the pieces of skin are then transferred to revolving cylinders supplied with an abundance of clean cold water, and afterwards are placed still wet in another chamber lined with wood, in which they are bleached and purified by exposure to the fumes of burning sulphur; they next receive their final washing with cold water, which removes the sulphurous acid. The next operation is to transfer them to the gelatinising pots. Water is poured in with the pieces, and kept at a high temperature by means of the steam in the cases surrounding the pots.

By this means the gelatine is quite dissolved out of the skin, and is strained off whilst still hot; it is poured out in thin layers, which as soon as they are sufficiently cooled and consolidated are cut into small plates, usually oblong, and laid on nets, stretched horizontally, to dry. It is then cut into shreds and is ready for market.

Another process, introduced by Mr Swineburne, consists in treating pieces of calfskin by water alone, without the soda and sulphur processes; the pieces, after simple washing, being transferred at once to the pots to be acted upon by the steam. Inferior gelatine is made from bones and other parts of animals; and it is understood that the enormous number of rats killed in the sewers and abattoirs of Paris are used by the gelatine-makers. The French manufacturers succeed better than any others in clarifying these inferior gelatines, and they rarely make any others; they run their plates out very thin, which gives them greater transparency; and they colour them with most brilliant colours, and form very fine-rolled sheets, tempting the eye with an appearance of great delicacy and purity.

Gelatine should never be judged by the eye alone. Its purity may be very easily tested thus: soak it in cold water, and then pour upon it a small quantity of boiling water; if pure it will form a thickish, clear, straw-coloured solution, free from smell, but if made of impure materials it will give off a very offensive odour, and have a yellow gluey consistency. No article manufactured requires such careful selection of material and such nice and cleanly manipulation to ensure a good marketable character; and those anxious for purity should avoid all artificially coloured varieties, however temptingly got up, unless they are required for merely decorative purposes and not for food. Of late years the commercial uses have greatly increased. Gelatine is the foundation of the dry-plate system of photography, and by its means the science has been revolutionised and its capabilities extended to an extraordinary degree. To the

printing process as employed by Messrs Goupil of Paris and others the world is indebted for cheap and at the same time highly artistic copies of many admirable pictures. It is further very extensively used by druggists for coating pills and nauseous drugs; and by confectioners for some kinds of sweetmeats. Chondrin, closely akin in composition and properties to gelatine, is obtained by the action of boiling water on cartilage. For gelatine as food and in picture work, see DIET, ILLUSTRATION, PHOTOGRAPHY. See also GLUTEN, ISINGLASS.

One of the qualities of gelatine is its power to form chemical combinations with certain organic matters; hence, when it is mixed and dissolved in a fluid containing such matters, it combines, and the compound is precipitated. It would appear that this combination, however, is threadlike in its arrangement, and that the crossing threads form a fine network through the fluid, which, in falling, carries down all floating substances that by their presence render the liquid cloudy; hence its great value in clarifying beer and other liquids. For this reason isinglass, which has been found the best gelatine for the purpose, is very largely consumed by brewers.

Various kinds of animal food are valued for the abundance of gelatine they contain, as the Trepang and Bêche-de-Mer (species of Holothuria), sharks' fins, fish-maws, ray-skins, elephant hide, rhinoceros hide, and the softer parts, all of which are luxuries amongst the Chinese, Japanese, Siamese, Malays, &c. Turtle-shells, or the upper and lower parts of the shield (*carapace* and *plastron*), constitute the callipash and callipee of the epicure, and form, in the hands of the experienced cook, a rich gelatinous soup. The fleshy parts of the turtle, calves' head and feet, and many other things might be enumerated as valuable chiefly in consequence of their richness in this material.

Gelderland. See GUELDERLAND.

Gelidium, a genus of *Algæ Florideæ* (see SEAWEEDS). *G. cartilagineum* and the allied *Gracilaria lichenoides* are said to be utilised in the building of the edible birds'-nests, so much prized by the Chinese (see, however, EDIBLE BIRDS'-NEST). These and allied species are largely used for food in the East, as yielding wholesome jellies.

Gell, SIR WILLIAM, English antiquary and classical scholar, was born at Hopton in Derbyshire in 1777. He was educated at Jesus College, Cambridge, graduating in 1798, after which he held for some time a fellowship at Emmanuel College. He devoted his time principally to antiquarian research and geographical studies, and published works on the topography of Troy (1804), Pompeii (4 vols. 1817–32), and Rome (1834); itineraries of Greece (1810), the Morea (1817), and Attica (1817), as well as a book on the *Geography and Antiquities of Ithaca* (1808), and a *Journey in the Morea* (1823). Of these works the best was that on the antiquities and topography of Pompeii. For some years after 1814 he was one of the chamberlains of Caroline, consort of George IV. He died at Naples, February 4, 1836.

Gellert, or KILLHART, the famous dog of Prince Llewellyn, which, left in charge of his infant child, after a desperate battle killed a wolf that had entered the house. The prince on his return, seeing the cradle overturned and the floor sprinkled with blood, thought the hound had killed his child, and at once plunged his sword into its side. A moment after he found the child safe under the cradle and the wolf lying dead, and saw too late the faithfulness of his dog. Gellert was buried under a tomb which stands to this day in the lovely village of Beddgelert, near the south base of Snowdon. The story is the subject of a beautiful ballad by the Hon. William-Robert Spencer (1769–1834), second son of the fifth Earl of Sunderland, who became also third Duke of Marlborough. He was the father of two colonial bishops, and the author of much fashionable poetry long forgotten, with this one ballad that will not die.

Welshmen not only show the grave of the faithful Gellert, but fix 1205 as the date at which he was given to the prince by his father-in-law. Unfortunately for them the story was long before current in Europe, with a snake instead of a wolf as the enemy. It is the first tale in the oldest Latin prose version of the *Seven Wise Masters*, entitled *Dolopathos*, written about 1184, and nearly a century before (about 1090), it had existed in *Syntipas*, a Greek version of the *Book of Sindibad*, the eastern prototype of the *Seven Wise Masters*. From the Latin *Dolopathos*, or from oral tradition, the story was taken into subsequent versions of the *Wise Masters*, and also into the *Gesta Romanorum*. It occurs also in the *Liber de Donis* of Etienne de Bourbon, who tells us that the grave was visited by the sick, and it reappears in the *Historia Septem Sapientum Romæ*, the parent of Wynkyn de Worde's *History of the Seven Wise Masters of Rome* (1505). The story of the Dog and the Snake thus occurs in all the western group of the *Book of Sindibád;* and of eastern texts or of versions derived from these, it is found in the Syriac, Persian, Greek, Hebrew, Latin (John of Capua's *Directorium Humanæ Vitæ*), and the old Spanish (translated from an old Arabic version now lost). It does not occur in the modern Arabic version (the Seven Vazírs), which is incorporated with the *Book of the Thousand and One Nights*. In the *Sindibád Náma* (written in 1374), a Persian metrical version, a cat is substituted for a dog. Again, in the *Panchatantra* version it is a mongoose or ichneumon that kills the snake; in the *Hitopadesa* it is a weasel. Dr Beal has translated a version from the *Vinaya Pitaka* of the Chinese Buddhist books (412 A.D.), itself said to be due to a much older Indian original, supposed to date from over 200 B.C. This Dr Beal considers the oldest form of the *Panchatantra* story. See vol. ii. of *Popular Tales and Fictions* (1887), by W. A. Clouston, who corrects some errors in the account in Baring-Gould's *Popular Myths of the Middle Ages*.

Gellert, CHRISTIAN FÜRCHTEGOTT, a German poet and moralist, was born July 4, 1715, at Hainichen, in the Erzgebirge, Saxony, and was educated at the university of Leipzig. After spending some years in teaching, in 1751 he received a professorship at Leipzig, where he lectured on poetry, eloquence, and morals, to large and enthusiastic audiences, until his death, 13th December 1769. His importance in German literature is due to the fact that around him gathered those who revolted against the pedantries and frigid formalities of Gottsched and his school, and thus pioneered the way for the more brilliant reaction of Goethe and Schiller. Gellert came to occupy this position partly on account of his writings, but more on account of his personal character. A man of sincere piety, a moral enthusiast, and with a genuinely good kind heart, he was beloved by his students, and they carried his authority beyond the walls of his lecture-room. His writings consist principally of *Fabeln und Erzählungen* and *Geistliche Lieder*, both sets great favourites from the simplicity and naturalness of their style, and, in the case of the latter, their unaffected piety. His *Sämmtliche Werke* appeared in 10 vols. in 1769–74; new ed. 1867. See his Life by Döring (1833).

Gellius, AULUS, a Latin author, who flourished in the 2d century of our era, and is supposed to have been born at Rome, and to have studied

philosophy at Athens, after which he practised law at Rome without abandoning his literary pursuits. His well known work, the *Noctes Atticæ*, begun during the long nights of winter in a country-house near Athens, and completed during the later years of his life, is a collection of miscellaneous and ill-arranged matter on language, antiquities, history, and literature, in 20 books, of which the 8th is wanting. It contains many extracts from Greek and Latin authors no longer extant. The best edition is that of Hertz (2 vols. Berlin, 1883–85); see also the same editor's *Opuscula Gelliana* (1886).

Gelnhausen, a town of Prussia, stands on the Kinzig and on the slopes of a vine-clad hill, 26 miles NE. of Frankfort-on-the-Main. Here, on an island in the Kinzig, Frederick Barbarossa built an imperial residence (the 'Pfalz'); and in 1169 he conferred upon the village the freedom of the empire. After being transferred to the counts of Hanau in 1435, Gelnhausen began to decay. It has several old buildings, as the town-house, some towers, the Catholic church, 'princes' house,' &c. Pop. (1895) 4496.

Gelon, tyrant of Gela and afterwards of Syracuse, was a scion of a noble family of the former city, and contrived to become successor to Hippocrates, its tyrant, in 491 B.C. Six years later he made himself master of Syracuse also, which then became the seat of his government, and to which he transferred the majority of the inhabitants of Gela. His influence soon extended itself over the half of Sicily. Gelon refused to aid the Greeks against Xerxes, as they declined to comply with his demand that he should be appointed commander-in-chief. He became embroiled with the Carthaginians because of their attack upon his ally, Theron of Agrigentum, and defeated them in a great victory at Himera, on the same day, according to tradition, on which the Greeks won the battle of Salamis. The clemency and wisdom of Gelon rendered him so generally beloved that when he appeared unarmed in an assembly of the people, and declared himself ready to resign his power, he was unanimously hailed as the deliverer and sovereign of Syracuse. Gelon died in 478 B.C., and his memory was held in such respect a century and a half after, that, when Timoleon razed to the ground all the statues of former tyrants, those of Gelon alone were spared.

Gelsemium nitidum (*G. sempervirens*), the yellow or Carolina jasmine (nat. ord. Loganiaceæ), is a climbing plant of the Atlantic southern United States, having large, axillary, fragrant, clustered blossoms and perennial dark-green leaves. The dried rhizome and rootlets are used in medicine, and contain an alkaloid, gelsemine, $C_{11}H_{10}NO_2$, to which the plant owes its physiological action. When the powdered rhizome, or any of the pharmaceutical preparations made from it, is taken internally in medicinal doses there ensues a feeling of languor, with slight depression of the circulation and lowering in the frequency and force of the pulse. In larger doses it acts as an active poison, causing cardiac depression, muscular weakness, and marked disturbance of vision—wide dilatation of the pupil and frequently squinting and ptosis. The central nervous system in man is also affected, the gait becomes staggering, general sensibility is much impaired, the respiration is slow and laboured, and the bodily temperature is lowered. If death results it is from failure of respiration. A solution of the alkaloid applied directly to the eye causes dilatation of the pupil and paralysis of accommodation. In medicine gelsemium is used to reduce the temperature in malarial and other sthenic fevers; it is also used in neuralgia, rheumatism, pneumonia, and pleurisy, and by dentists.

Gelsenkirchen, a modern manufacturing town of Westphalia, 4 miles NW. of Bochum. It owes to coal and iron its rise from a mere village since 1860. Pop. (1880) 14,615; (1890) 28,057.

Gem, a term often used to signify a precious stone of small size, such as may be used for setting in a ring, or for any similar purpose of ornament; but sometimes by mineralogists in a sense which they have themselves arbitrarily affixed to it, for the purpose of scientific classification, as the designation of an *order* or *family* of minerals, generally hard enough to scratch quartz, insoluble in acids, infusible before the blowpipe, without metallic lustre, but mostly brilliant and beautiful. Among them are included some of the minerals which, in popular language, are most generally known as gems—ruby, sapphire, spinel, topaz, beryl, emerald, tourmaline, hyacinth, zircon, &c.—and some other rarer minerals of similar character; but along with these are ranked minerals, often coarser varieties of the same species, which are not *gems* in the ordinary sense of the word, as emery and common corundum, whilst diamond and some other precious stones, much used as gems, are excluded. See Streeter's *Precious Stones and Gems* (1879). While the term gem is thus used currently to denote jewels and precious stones, it is strictly applicable only to such hard and precious stones as have been worked by engraving. When the engraved design is sunk in the stone the gem forms an intaglio, signet, or seal, and when the subject is in relief the gem is a Cameo (q.v.). The rarer and more costly precious stones, such as the diamond, ruby, emerald, and sapphire, are seldom treated by engraving, because, in addition to the excessive difficulty of working them by engravers' methods, their value principally depends on their brilliance of sparkle and colour. The stones of the gem-engraver are almost exclusively the variously coloured, mottled, and banded varieties of chalcedony quartz, which are differently named according to the appearance they present. From the gem-engraver's point of view, the most important stones are carnelian, sard, chrysoprase, plasma, bloodstone, jasper, agate, and onyx. As these names indicate only differences of colour and shades, degrees of translucency, and alternations of bands, all of which characteristics merge into each other, they are incapable of precise definition. The banded stone, generally called Onyx (q.v.), is used as the principal material for cameo-engraving, the relief subject being worked in one coloured band or stratum on a ground of a different colour.

The art of gem-engraving developed from the customary use of seals among the ancient Egyptians and other early civilised communities of the East. In addition to abundant remains of seals of high antiquity, we have ample testimony to their important functions from numerous references in early literature. Thus, in Genesis, xxxviii. 18, we read that Tamar demanded of Judah his signet as a pledge; and Pharaoh, in investing Joseph with the office of principal minister, gave him his signet-ring as a token of authority. The early seals of the Egyptians were cut in the form of the scarabæus or sacred beetle, with the intaglio design engraved in a flat base; and in this form they were followed by the early Greeks and the Etruscans. Among the Chaldeans, Babylonians, and Assyrians the primitive seals took the form of cylinders, around

Fig. 1.—Carnelian Etruscan Scarabæus: Centaur and Deer.

which the intaglio device was engraved. An impression in soft clay or other medium was obtained from such seals by gently rolling the cylinder over the surface to be impressed. The earliest of such intaglios were cut in steatite, serpentine, and other comparatively soft stones; but these materials by degrees gave way to the harder and more enduring materials in which it was possible to sculpture fine details with great minuteness. The cylindrical signet of Darius I. of Persia, engraved in chalcedony, and preserved to the present day, is an example of the art at its highest development among the Asiatic monarchies.

From the nature of the subjects engraved on gems, and from the method in which they were mounted, it is evident that they soon came to be employed otherwise than as signets. Gems came to be worn as personal ornaments mounted in rings and in other settings, they were treasured as works of art, and they were treated as charms to avert evil and to win success and the favour of gods and men. For the breastplate of the Jewish high-priest, Moses was instructed to 'take two onyx stones, and grave on them the names of the children

Fig. 2.—Chalcedony Cylinder: Signet of Darius I.

of Israel. . . . With the work of an engraver on stone, like the engravings of a signet, shalt thou engrave the two stones' (Exodus, xxviii. 9–11). With the extension of the uses of gems, the forms of the stones also changed; in the case of cylinders first into cones engraved on the base, then into hemispherical stones, ultimately taking a flat thin form through which the light would pass sufficient to show the engraving by transmitted light; and with this view the stones were sometimes convex and cut *en cabochon*. Ancient gems, like ancient coins, were generally irregular in outline, but at all times their prevailing form was oval.

The earlier engraved gems of the Greeks, as already mentioned, were in the form of scarabs. In these the engraved intaglio was enclosed in a guilloche or engrailed border, and the engraving was stiff and formal, in every respect like Etruscan work. Gem-engraving in Greece reached its highest perfection during the three centuries which preceded the Christian era, and the names of some of the most famous artists of that period have been handed down to the present day. In Rome the art was encouraged, and flourished till the period of the Antonines, after which it rapidly declined; and such Byzantine work as exists is rude in execution, and interesting only from the fact that with it Christian subjects begin to appear in gems. Cameo-engraving was not practised till the days of imperial Rome.

Fig. 3.
Greek Sard, with Indian Bacchus.

The subjects of ancient gems embrace the whole circle of ancient art, and follow the laws of its development, animal forms being succeeded by those of deities and subjects derived from the battles of Greeks and Amazons and Centaurs, the exploits of Hercules and other heroes; then by scenes from tragedians and later myths; and finally by portraits, historical representations, and allegories. The inscriptions consist of the names of deities, heroes, and subjects; dedications to deities; the names of artists, sometimes in the genitive case, but often accompanied by the verb *epoei*, 'fecit;' addresses to individuals; gnomic or other sayings, indicating that the gems are amulets against demons, thieves, and various evils, or charms for procuring love; the names of the possessors, and sometimes addresses, occasionally even distichs of poetry, and various mottoes. These inscriptions were often added by subsequent possessors, and are not of the age of the gem itself.

With the decline of the arts generally, the art of gem-engraving sank during the middle ages, to be awakened again only through the patronage of the Medici family in Italy in the 15th century, and with varying fortunes it continued to be practised till the early part of the 19th century. Strictly classical models, and to a large extent classical subjects, have been chosen by modern engravers, and towards the end of the 18th century the practice of foisting modern imitations on buyers of gems as genuine Greek works of the best period became very prevalent. Prince Poniatowsky, who inherited a small collection of ancient gems from Stanislaus, last king of Poland, employed the most skilful engravers of his day to fill up his cabinet with imitation antiques on which the names of the most eminent engravers of antiquity were forged. The Poniatowsky forgeries did much to bring gem-engraving into disrepute, and to lower the value of even fine and undoubted works. The diagnosis of gems has been rendered a work of extreme difficulty; and, as the modern imitator possesses conveniences for his task which were not at the disposal of the ancient artist, works of high artistic merit and great finish are more likely to be modern than ancient.

In modern times a considerable trade has been carried on in the preparation of artificial gems, both cameos and intaglios, for jewelry purposes and for the cabinets of collectors. The most famous and successful maker of pastes was James Tassie, a native of Pollokshaws, near Glasgow, who in the latter half of the 18th century settled in London, and then, with marvellous industry, succeeded in copying upwards of 15,000 of the most famous and artistic gems of ancient and modern times. But Tassie's activity was not confined to the copying of gems alone. He produced in cameo a large series of portraits of his most famous contemporaries, and, while his whole productions are now highly prized, these large cameos are in great request, and command high and steadily-increasing prices.

Paste copies of existing gems are made with comparative ease, by obtaining an impression from the original in very fine moist Tripoli earth or rotten-stone, which mould is carefully dried. A piece of glass of the required colour and size is then laid over the mould, and placed in a furnace, which is raised to a heat sufficient to melt the glass, causing it to flow over and accurately fill the mould. When a cameo is being made, the raised portion alone is so moulded in opaque white glass, and, its back being ground flat and smooth, it is cemented to a mount of any desired colour. In some cases the mount itself is melted to the already formed relief portion, which for this purpose, after grinding away of the superfluous glass, is reintroduced into the furnace embedded in a Tripoli mould to allow of the mount being melted over it. Portrait cameos are made from wax models, casts

of which are taken in the same way as moulds are obtained from gems.

For the making of imitation gems or precious stones (engraved or not) from glass specially prepared and coloured, as well as for the production of actual but artificial precious stones by chemical methods, see STONES (PRECIOUS), as also DIAMOND, RUBY, PEARL, &c. For seals, see SEAL.

The chief implement used by the ancient engravers appears to have been made by splitting corundum into splints by a heavy hammer, and then fixing these points like glaziers' diamonds into iron instruments, with which the work was executed by the hand (*ferra retusa*). The drill, *terebra*, was also extensively used for hollowing out the deeper and larger parts of the work, and emery powder, the *smaris* or Naxian stone, for polishing. The so-called wheel, a minute disc of copper, secured to the end of a spindle, and moistened with emery powder or diamond dust, and driven by a lathe, does not appear to have come into use till the Byzantine epoch. It has been conjectured that the artist used lenses of some kind, or globes filled with water, to execute his minute work; but the ancient, like the modern engraver, rather felt than saw his way. All these processes were not employed by the same artist, for, besides the engraver (*sculptor cavarius, dactylioglyphus*), there was a polisher (*politor*), not to mention arrangers (*compositores gemmarum*), and merchants (*gemmarii, mangones gemmarum*) who drove a flourishing trade in emeralds and pearls and engraved stones in the days of Horace.

The principal writers of antiquity who treated of gems are Onomacritus or the Pseudo-Orpheus, Dionysius Periegetes, Theophrastus, and Pliny, whose chapter is compiled from antecedent Greek and Roman authors. Isidorus, 630 A.D., gives an account of the principal stones; so do Psellus and Marbodus in the 11th century.

See Mariette, *Pierres Gravées* (Paris, 1750); Raspe, *Descriptive Catalogue of Engraved Gems* (Lond. 1791); Milin, *Introduction à l'Étude des Pierres Gravées* (Paris, 1797); Krause, *Pseudoides* (Halle, 1856); King, *Antique Gems and Rings* (3d ed. 2 vols. 1872), and *Handbook of Engraved Gems* (2d ed. 1885); Bucher, *Gesch. der technischen Künste* (1875); Billings, *Science of Gems*, &c. (Lond. 1875); Panner, *Les Lapidaires Français du Moyen Âge* (Paris, 1872); Jones, *History and Mystery of Precious Stones* (1880); Gatty, *Catalogue of the Engraved Gems in the Collection of J. Mayer* (1879); *Catalogue of the Engraved Gems in the British Museum* (Lond. 1889).

Gemara. See TALMUD.

Gemini ('the Twins'), the third constellation in the zodiac. See CASTOR AND POLLUX.

Gemistus. See PLETHO.

Gemmation. See REPRODUCTION.

Gemmi Pass, a narrow path, nearly 2 miles long, which crosses the Alps at a height of 7553 feet, and connects the Swiss cantons of Bern and Valois.

Gemot. See FOLKMOOT, VILLAGE COMMUNITIES, WITENAGEMOTE.

Gems-bok (*Oryx Gazella*), a species of antelope, described by some naturalists as the Oryx, but which, being a native of South Africa only, cannot be the Oryx of the ancients, although it is certainly a nearly allied species. It is a heavy, stout animal, about the size of a stag, with rough reversed hair on the neck and along the ridge of the back; large pointed ears; and almost perfectly straight horns, fully two feet long, in the plane of the forehead, little diverging, and obscurely ringed at the base. The colours are harshly contrasted, dark rusty gray above, and white on the under parts, separated by a broad dark brown or black band; the head white, with black transverse bands; the thighs black, and the legs white. The hoofs are

Gems-bok.

remarkably long, adapted to the rocky mountainous districts which the animal frequents. The Gems-bok makes such use of its horns as sometimes even to beat off the lion. It inhabits districts free from wood, and is generally found in pairs or in very small herds.

Genazzano, a small town of 4008 inhabitants, 27 miles E. of Rome, containing an old castle of the Colonna family, and the far-famed pilgrimage chapel of the Madonna del Buon Consiglio. See *The Virgin Mother of Good Counsel*, by DR G. F. Dillon (1885).

Gendarmes (Fr., 'men-at-arms') were originally mounted lancers, armed at all points, and attended by five inferior soldiers, who were furnished by the holders of fiefs; these were replaced by Charles VII.'s *compagnies d'ordonnance*, which were dissolved in 1787, one company of gendarmerie being retained as the bodyguard of Louis XVI. Since the Revolution, except for a short interval at the Restoration, the gendarmes have constituted a military police, which superseded the old *maréchaussée*, and comprises both cavalry and infantry; divided into legions and companies, and these latter into brigades, the organisation of the force corresponds to the territorial divisions of the army. The men receive much higher pay than the rest of the army, of which, however, the corps is a part, its members being drafted from the line for this service. Germany also since 1808 has had its *gendarmen*. See POLICE.

Gender, a grammatical distinction between words corresponding directly or metaphorically to the natural distinction of sex. Names applied to the male sex are said to be of the *masculine* gender; those applied to the female sex, *feminine;* while words that are neither masculine nor feminine are said to be *neuter* or of *neither* gender. In modern English we have no such thing as merely grammatical gender, save when sex is implied metaphorically to inanimate things (a ship, a steam-engine, &c.) by such a figure of speech as personification; but in Old English, as well as in Sanskrit, Greek, and Latin, the greater part of inanimate things are either masculine or feminine, the others being neuter; and this distinction of gender is marked by the terminations of the nominative and other case-endings. Grammatical gender went gradually out of use after the Norman

Conquest, the northern dialects being the earliest to discard it. In Hebrew there is no neuter, all names being either masculine or feminine, as also in the modern Romance tongues, Italian, French, Spanish, and Portuguese. German, again, in this particular resembles Old English and the classical tongues. See GRAMMAR.

Genealogy. See PEDIGREE.

General, or GENERAL OFFICER, is an officer of the general staff of the army. A field-marshal or general commanding-in-chief would in the field usually command several Army Corps (q.v.), a general one corps, a lieutenant-general one Division (q.v.), a major-general one Brigade (q.v.). Brigadier-generals in the British army are usually colonels in temporary command of brigades. In 1901 there were 8 field-marshals in the British army, 23 generals, 32 lieutenant-generals, and 115 major-generals; there were also 10 surgeon-generals and one surgeon-colonel ranking as major-generals. If unemployed for five years in either rank they are compulsorily retired. Also, a major-general must retire if he reaches sixty-two without being promoted, and a lieutenant-general or general at sixty-seven. Promotion amongst the generals is by seniority, unless there are good grounds for a contrary course, but promotion to field-marshal is made by the sovereign without respect to seniority. Colonels, if under fifty-five (sixty-two if holding temporary rank as major-general), and stated to be competent by the commander-in-chief, are eligible for promotion to general's rank, and the seniors are usually taken to fill vacancies as they occur; but at any time a colonel may be promoted for distinguished conduct.

As regards pay, when actively employed a general commanding-in-chief receives £10, 15s. a day; a general not in chief command, £8; a lieutenant-general, £5, 10s.; a major-general, £3; and a brigadier-general, £2, 10s., all exclusive of allowances for forage, &c. When on half-pay a field-marshal receives £1300 a year, the others £800, £650, and £500 respectively. When retired a general receives £1000 a year, a lieutenant-general £850, and a major-general £700; but there are various modifications affecting these amounts.

The rank of *captain-general*, superior even to field-marshal, is held by the sovereign *ex officio*, and is borne by the colonel of the Honourable Artillery Company of London, but otherwise it has not been conferred upon any officer of the British army during the 19th century.

In the United States the rank of general, a higher rank than had before existed, was created by act of congress in 1866, and conferred on General Grant. It was subsequently conferred on Sherman and on Sheridan. The highest rank held by Washington was that of lieutenant-general, which is also usually that of the general-in-chief of the army. There is, of course, but one lieutenant-general; and by law there can be but three major-generals and six brigadier-generals. The general's yearly pay is $13,500; the lieutenant-general's is $11,000; the major-general's, $7500; the brigadier-general's, $5500. In the militia there are ranks with like names, and the title of general as a form of address is consequently of embarrassing frequency in the United States.

General, in the Roman Catholic Church, the supreme head, under the pope, of the aggregated communities throughout Christendom belonging to a religious order (though the *abbas abbatum* of the Benedictines is not actually styled 'general'). The governing authorities of the monastic orders in the Roman Catholic Church may be arranged in three classes: (1) the superiors of individual convents or communities, called in different orders by the various names of abbot, prior, rector, guardian, &c.; (2) the provincials, who have authority over all the convents of a 'province'—the provinces being usually coincident in limit with kingdoms; (3) the general, to whom not only each member of the order, but all the various officials of every rank are absolutely subject. The general is usually elected, commonly by the general chapter of the order, which, in the majority of orders, consists properly of the provincials; with these, however, are generally associated the heads of the more important monasteries, as also the superiors of certain subdivisions of provinces. The office of general in most orders is held for three years. In that of the Jesuits it is for life; but in all the election of the general chapter must be confirmed by the pope. In most orders, too, there is assigned to the general a consultor (*admonitor*) or associate (*socius*), who, however, is only entitled to advise, and has no authority to control the superior. The general also is supposed to consult with and to receive reports from the various local superiors. He sends, if necessary, a visitor to inquire into particular abuses, or to report upon such controversies as may arise, and he holds a general chapter of the order at stated times, which differ according to the usage of the several orders. The general is exempt from episcopal jurisdiction, being subject to the immediate jurisdiction of the pope himself. He resides in Rome, where he enjoys certain privileges, the most important of which is the right to sit and vote with the bishops in a general council of the church. See MONACHISM, and the articles on the several orders.

General Assembly. See ASSEMBLY, GENERAL.

Generalisation is the act of comprehending under a general name a number of objects which agree in one or more points. These points are specially attended to by the process of Abstraction (q.v.), and are indicated by the common name. The result of generalisation is a common name or general term, which stands for the many objects in so far only as they all agree. This process is closely akin to classification and to definition; and the higher kind of generalisation is Induction (q.v.).

In logic the genus is a higher class which includes a lower, the lower one being the *Species;* but the distinction is only relative. That which is a genus in relation to its species is itself a species in regard to a higher genus. The genus has the larger Extension (q.v.), the species the larger intension. For the great question as to whether the genera and species have a *real* existence, see NOMINALISM. For genus in natural history, see GENUS.

Generation, a single succession in natural descent, the children of the same parents; in years three generations are accounted to make a century.

Generation, SPONTANEOUS. See SPONTANEOUS GENERATION.

Generations, ALTERNATION OF, an interesting complication in the life-history of many plants and animals, the organism producing offspring which are unlike itself, but which in turn give rise to forms like the original parents. Thus, a zoophyte buds off a swimming-bell, and the fertilised ova of the latter develop into the former. Early in the century the poet Chamisso, accompanying Kotzebue on his circumnavigation of the globe, called attention for the first time to the fact of alternation as observed in one of the locomotor tunicates (Salpa); the progress of marine zoology and the study of parasitic worms gave many natural

ists glimpses of other alternations; but Steenstrup was the first to generalise the results in his work published in 1842, entitled 'On the Alternation of Generations; or the propagation and development of animals through alternate generations, a peculiar form of fostering the young in the lower classes of animals.' From hydroids and flukes he gave illustrations of the 'natural phenomena of an animal producing an offspring which at no time resembles its parent, but which itself brings forth a progeny that returns in its form and nature to the parent,' and distinguished the interpolated generation as the *Amme*, or 'wet-nurse.' His essay was sternly criticised by Owen in 1849, while Leuckart attempted to treat all the alternations as cases of metamorphosis. Criticism, however, has only rendered Steenstrup's generalisation more precise, and the observations of some of the foremost naturalists have shown that the phenomena are of wider occurrence than was at first supposed, though the form of the alternation varies widely in the different cases.

(*a*) *The Rhythm between Sexual and Asexual Reproduction.*—The simplest case to start with is that of many hydroids where a sessile, plant-like zoophyte—a colony of numerous nutritive 'persons'—produces in the summer months modified reproductive individuals which are set adrift as medusoids. These become sexual, and their fertilised ova develop into embryos which settle down and give rise to the sessile zoophyte from which we started. The life history may be written in the formula:

$$\frac{M}{F} - A - \frac{M}{F} - A - \frac{M}{F}$$

(where M and F stand for male and female, and A for asexual generation).

The life-history of the common jelly-fish (Aurelia) (fig. 1) illustrates a similar contrast. From the

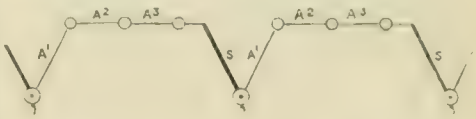
Fig. 1.—Life-history of the common Jelly-fish:
1, free-swimming embryo (*planula*); 2-6, the embryo fixed developing into a 'hydra-tuba,' which (7-8) divides transversely into a pile of individuals; these in turn (9) are liberated and grow (10-11) into jelly-fish. (From Haeckel.)

large free-swimming sexual jelly-fish embryos are produced which develop not into jelly-fish again, but into sessile tubular organisms or 'hydra-tubæ.'

A, asexual, produces S, sexual, from fertilised ovum of which A again arises.

From these, by growth and division in an entirely asexual fashion, the jelly-fish are in turn reproduced. Here the sexual generation is the more stable and conspicuous—the reverse of the former case, but the same formula applies, or the preceding graphic notation. In the free-swimming Tunicata (Salpa and Doliolum) the alternation is somewhat more complex, but in no essential respect different.

(*b*) *Alternation between Sexual and Degenerate Sexual Reproduction.*—The life-history of the common liver-fluke, sketched in the article FLUKE, is in most cases as follows: From the fertilised ovum of the fluke an embryo develops, which produces several asexual generations, the last of which grow up to become sexual flukes. Now the asexual generations are not products of division or budding, but arise from what, though not ova, may be called precocious reproductive cells; in fact, they arise by a degenerate process of parthenogenetic reproduction in early life. The facts may be thus expressed:



where A' and A'' represent two of the interpolated asexual generations.

This alternation between sexual reproduction by fertilised ova and reproduction by means of special cells which require no fertilisation prevails in many plants—e.g. ferns and mosses. From a fertilised egg-cell arises the ordinary fern-plant with which all are familiar. This, however, produces no male or female elements, but simply 'spores,' which are able of themselves (when they fall to the ground) to develop a new organism—the inconspicuous but sexual 'prothallus.' This bears male or female organs or both, and from the fertilised egg-cell thus produced the conspicuous vegetative, sexless fern-plant once more arises. The facts may be again expressed in notation:

A, the vegetative sexless fern-plant produces a spore (*sp.*) from which the sexual 'prothallus,' S, arises, giving origin to fertilised egg-cells, and thereby recommencing the cycle.

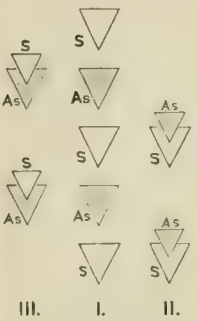
The same formula will apply to the moss. The familiar moss-plant bears male and female reproductive organs. From a fertilised egg-cell so produced a sexless spore-producing generation at once develops, and grows like a parasite on the apex of the moss-plant. The spores fall to the ground, and grow out into threads ('protonema'), from which there is finally budded the moss-plant with which we started.

Besides the above alternations there are other rhythms, some more complex, others much less frequent, into which we cannot here enter. In some cases the life-history of the liver-fluke, by the division of the embryo (sporocyst), combines the alternations (*a*) and (*b*); in some midge larvæ juvenile parthenogenesis alternates with the adult sexual process; in not a few cases, as in aphides, the rhythm is between parthenogenesis and normal sexual reproduction; while finally there is an alternation of two different *sexual* generations in three thread-worms or nematodes.

Occurrence.—Alternation of generations is hinted

at in the colonial Radiolarians, is definitely seen in the fresh-water sponge, is very characteristic of the Cœlenterates, prevails with curious complications in the flukes, is doubtful in tapeworms, occurs in one form in a few Nematodes and in certain Chætopods (Syllids), is represented by the rhythm between parthenogenesis and sexual reproduction in crustaceans and insects, and is very emphatic where it was first observed—in the locomotor tunicates.

In the lower plants, algæ and fungi, an alternation between spore-producing and truly sexual generations is frequent. In mosses and ferns it is almost constant, and yet more marked. Occasionally spore-formation or sex-cell formation may be suppressed, and the life-history thus simplified. In the flowering plants what corresponds to the sexual generation of a fern is much reduced; it has come to remain continuous with the vegetative asexual generation, on which it has had a subtle physiological reaction.



I. expresses ordinary alternation between sexual (S) and asexual (As) generations; in II. the asexual is increasingly subordinated to the sexual (as in mosses); in III. the sexual is subordinated to the asexual (as in flowering plants).

Hints as to Rationale.—The origin and import of the above rhythms, and their relation to the theory of heredity, are difficult problems. To some extent, however, it is easy to recognise that some of the alternations only express with emphasis the fundamental organic antithesis between nutrition and reproduction. A fixed hydroid—passive and well nourished, is preponderatingly vegetative and asexual; the reverse habit, the physiological rebound, finds expression in the actively locomotor sexual swimming-bell or medusoid. In the same way, though the alternation is less strictly between asexual and sexual, the contrast between the deeply-rooted, leafy, spore-bearing fern-plant and the inconspicuous, weakly-rooted, slightly-exposed, sexual prothallus is again fundamentally parallel. Alternation of generations is in fact an emphasised rhythm between the anabolic and katabolic tendencies so fundamental in the individual and racial life. To this, however, it will be necessary to return in the article REPRODUCTION.

See Steenstrup, 'On the Alternation of Generations' (Eng. trans. Ray Society, 1845); Owen's *Parthenogenesis* (1849); Haeckel's *Generelle Morphologie* (Berlin, 1866); Geddes and Thomson, *The Evolution of Sex* (Lond. 1889).

Genesee, a remarkable river rising in Pennsylvania, and flowing nearly 200 miles north through western New York into Lake Ontario, 7 miles N. of Rochester. The Genesee is famous for its extraordinary falls. Three of these occur within a distance of 1½ mile; two are respectively 68 and 90 feet high, and the Portage Falls are 110 feet high. The river has also a sheer fall of 95 feet at Rochester, utilised for water-power; and another cascade, a few miles below, is almost as high.

Genesis (Gr., 'origin,' 'generation'), the name given by the Septuagint to the opening book of the Pentateuch. In the Hebrew Bible it is named, from its first word, *Bereshith* ('in the beginning'). Critics are agreed that the book, like the rest of the Pentateuch, is a mosaic, drawn from various sources. A general description of these is already given in the section on the *Law and Historical Books* in the article BIBLE.

In Genesis the historical thread of the Priestly Code runs parallel to that of the Jehovistic element, which, in the view now prevailing, is the earlier of the two. The Priestly Code opens the book with its account of the creation of the world (i. 1—ii. 4*a*), which is immediately followed by the Jehovistic account (ii. 4*b*—iii. 24). After these are given, both in the Priestly narrative and the Jehovistic, the transition from Adam to Noah (iv. v.), the flood (vi.–ix.), and the transition from Noah to Abraham (x. xi.). In Genesis the Priestly narrative is a summary of facts mainly subordinated to the development of the theocracy. The history is broken into sections, each beginning with the words, 'these are the *generations* of,' &c. (cf. v. 1; vi. 9; x. 1; xi. 10, &c.), whence the name *Genesis* is derived. The whole is divided into three periods, each introduced by a covenant—(1) with Adam (i. 28—ii. 4); (2) with Noah (ix. 1–17); and (3) with Abraham (xvii.). Each covenant has its sign: the first has the Sabbath (ii. 3), the second the rainbow (ix. 12), the third circumcision (xvii. 10). These three periods and covenants lead up to the fourth period and covenant—viz. the Mosaic. The writer proceeds in an orderly and circumstantial manner, giving much attention to chronology, and, for the sake of clearness, sometimes repeating details more in the style of a lawyer than a historian (cf. vii. 13–16; viii. 15–19; xxiii. 17, 18, 20). The name for God used by him in Genesis is *Elohim* or *El Shaddai* (see Ex. vi. 3). The promises are by him confined to Israel, and have no reference to salvation through Israel for Gentiles (cf. xvii. 6–8; xxviii. 3, 4; xxxv. 11, 12).

The 'skeleton of ethnographic genealogy' which, in both narratives, is the foundation of the patriarchal history, is in the Jehovistic 'covered with flesh and blood.' Here the characters are living men, and their passions and actions are traced with the deep moral and religious inspiration and the marvellous epic vividness and force which give their imperishable charm to the stories of Genesis. And it is the prophetical narrative that shows how the Divine purpose included from the beginning a remedy for the world's sin (iii. 15), reveals the long-suffering mercy of the Divine mind (cf. viii. 21, 22; xviii. 23 *et seq.*), and prophesies that 'in Abraham's seed shall all the nations of the earth be blessed' (xii. 3; xviii. 18; xxviii. 14). For the distinction made between different parts of the *prophetical* narrative (less obvious than that between the prophetical narrative itself and the Priestly Code), see PENTATEUCH. How the conclusions of science have affected the literal faith in the descriptions of creation given in Genesis is shown in the article CREATION, and in Riehm, *Der biblische Schöpfungsbericht* (Halle, 1881).

See the Commentaries by Luther, Calvin, Rosenmüller (1821), Kimchi (edited by Ginsburg, 1842), Kalisch (Lond. 1858), Wright (*ib.* 1859), Cook and others (*ib.* 1871), Tuch (2d ed. by Arnold & Merx, 1871), Reuss, F. Delitzsch (4th ed. Leip. 1872), Lange (2d ed. 1877), Keil (3d ed. 1878), Dillmann (4th ed. 1882), and Dods (Edin. 1882). See also Knobel, *Die Völkertafel der Genesis* (Giessen, 1850); Wellhausen, *Prolegomena* (Eng. trans. 1885); and Driver's *Notes on Lessons from the Pentateuch* (New York, 1887).

Genette, or GENET (*Genetta*), usually regarded as a separate genus of carnivorous mammals, but by some included in the genus Civet (q.v.). The genettes differ from the civets in their smaller size, the vertically slit pupil, the completely retractible claws, the smallness of the anal pouch, and the faintness of the characteristic odour. Of six species of genette, five are found only in Africa; the common genette is found also in the south of

Europe and Syria. Its fur is gray with black or brown spots, and it is the only viverrine animal

Common Genette (*Genetta vulgaris*).

found in Europe. Genettes may be trained to catch mice like cats.

Geneva, a canton in the south-west of Switzerland, is bounded N. by the canton of Vaud and the Lake of Geneva, and S., E., and W. by the territories of France. Area, 108 sq. miles; pop. (1880) 101,505; (1888) 105,509, of whom more than half were Catholics, whilst 85 per cent. spoke French as their mother tongue. It is watered by the Rhone and the Arve, which unite about 2 miles from the south-west extremity of the Lake of Geneva. The surface is hilly, chief eminences being the steep Salève (4528 feet) and the Reculet (5631); but the soil, which is not naturally fertile, has been rendered so by the industry of the inhabitants. According to the constitution of 1847, since amended, all male citizens of twenty years of age exercise the right of electing representatives to the cantonal council, the supreme legislative body, the age of members of which must be at least twenty-five years. There is a representative for every 1000 inhabitants. The executive is confided to a council of state composed of seven members, nominated for two years by universal suffrage. The constitution guarantees civil and religious liberty, all forms of worship being allowed by law; but the national church is the Reformed Calvinistic. Primary education is compulsory, but free. The chief branches of industry are gardening, vine and fruit growing, and the manufacture of articles of *bijouterie* and watches. In the two last-named branches the annual production is valued at nearly one million pounds sterling. Musical-boxes, chronometers, mathematical instruments, with pottery, &c., are also made. The chief town is Geneva.

Geneva (Fr. *Genève*, Ger. *Genf*, Ital. *Ginevra*), capital of the Swiss canton of the same name, is situated at the exit of the Rhone from the Lake of Geneva, 388 miles by rail SE. of Paris. A Gallic town originally, Geneva acknowledged Roman supremacy in 120 B.C. It was a place of some importance under the Burgundian kings, from whom it passed in 534 to the Franks, and from them towards the end of the 9th century to the new kingdom of Burgundy. It had been made a bishop's seat in the 4th century. From the 12th century a continual feud existed between the bishops and the Counts and Dukes of Savoy with regard to the supremacy—a state of things which the citizens took advantage of to obtain a considerable share of municipal liberty for themselves. Having secured Freiburg (1519) and Bern (1526) for allies, the republic of Geneva finally won its complete independence from Savoy. The acceptance of Protestantism by the republic a few years later brought to an end its alliance with the Roman Catholic republic of Freiburg, and exposed it to fresh attacks from the House of Savoy; and it was only saved by the timely intervention of its staunch ally Bern (1536). In the summer of that same year Calvin (q.v.) arrived at Geneva, and began his reconstitution of the political and social life of the city, which created it one of the chief strongholds of Protestantism in Europe. In 1602 the last attempt of the Dukes of Savoy to recover the town was frustrated by the citizens. During the 18th century Geneva was distracted by unceasing feuds between the aristocratic and popular parties, until in 1782 Bern, Sardinia, and, in particular, France interfered in favour of the aristocracy. The French Revolution led to a new crisis: the government was overthrown in July 1794, equality in the eye of the law was established, a national convention appointed, and a reign of terror commenced. In 1798 Geneva and its territory were annexed to France; but, after the overthrow of Napoleon, they recovered their independence and joined as twenty-second canton the Swiss Confederation under the sanction of the treaties of Vienna and of Paris (1815). The aristocratic party managed to repossess themselves of the government of the city, and their rule was only superseded by a more democratic constitution after much agitation and several risings of the people between 1842 and 1846, in which the leading spirit was Fazy (q.v.). After 1870 the town was for some years kept in a state of unrest owing to the attempt of the Ultramontanes to revive the Roman Catholic bishopric of Geneva.

Formerly Geneva was surrounded by walls, and consisted of clusters of narrow and ill-drained streets; but since the accession of the radical party to power in 1847 the town has been almost entirely rebuilt in modern style. The ancient ramparts have been removed, streets widened and well paved, new and commodious quays constructed along the shores of the lake and river, and various improvements introduced, chief amongst which is the erection of a breakwater, within which steamboats are received and lie in safety. In its course through the town the Rhone forms two islands, on one of which still exists an antique and picturesque cluster of buildings; on the other, laid out as a public pleasure-ground, is a statue of Rousseau. In the Place des Alpes is a sumptuous monument to Duke Charles XI. of Brunswick, who, dying here in 1873, left 16,500,000 francs to the city. Famous as a theological, literary, and scientific centre, Geneva has given birth to Rousseau; to the physicist De Saussure; to the naturalists Charles Bonnet and the Pictets; to Necker, father of Madame de Staël; to the humorist Toepffer; to Cherbuliez; to Amiel; and to the sculptor Pradier. The principal edifices are the Transition cathedral of St Peter, which dates from 1124; the town-hall, within which the members of the Alabama (q.v.) arbitration met in 1872; the academy, founded by Calvin in 1559, with a library of 110,000 volumes, and in 1873 converted into a university (with about 600 students); the magnificent theatre, opened in 1879, which ranks next in size to the Paris Opéra and the Court-theatre of Vienna; the Rath Museum (1824–26); the Fol Museum, with collections of Greek, Roman, and Etruscan antiquities; the Athenæum, devoted to the fine arts; and the museum of natural history, containing De Saussure's geological collection, admirable collections of fossil plants, &c. The staple manufactures of the town are watches, musical-boxes, and jewelry. Pop. (1885) 51,537 (with the suburbs Plainpalais and Eaux Vives, 74,453; in 1900, 92,969). See works by Cherbuliez (1868), Blavignac (1872), and Roget (1870–83).

The Geneva Convention (1864), signed by twelve delegates from various countries, mainly regards the succour of the wounded in time of war, and forbids cruel methods of warfare (e.g. the use of explosive bullets). The resulting international code was ultimately adopted by all civilised powers except the United States; and a 'Red Cross Society' was established, which became very prominent and helpful during the Franco-German war (1870–71), its flag, with the 'Geneva Cross,' being recognised as neutral. Other international conferences for promoting the same objects were held at Paris (1867) and Berlin (1869). For the Geneva Bible, see BIBLE.

Geneva, a town of New York, at the north end of Seneca Lake, 26 miles W. of Auburn by rail, with flouring-mills and manufactures of engines, boilers, &c. It is the seat of Hobart College (Episcopal, founded in 1824). Pop. (1890) 7557.

Geneva, LAKE OF, or LAKE LEMAN (*Lacus Lemanus*), situated between Switzerland, to which the larger portion belongs, and France. It lies 1218 feet above the level of the sea, and extends for 45 miles from east to west, in the form of a crescent. Its greatest breadth is 9 miles, its area 223 sq. m., and its maximum depth is 1022 feet. This lake at some periods of the year presents a curious phenomenon: the whole mass of water oscillates from side to side of the lake, causing, especially near Geneva, a rise and fall of from two to five feet in the course of about eight or ten minutes (*seiche*). The phenomenon is probably due to differences of barometric pressure on different parts of the surface. The lake abounds in fish. The shore on the side of the Pays de Vaud is a classic spot, celebrated by J. J. Rousseau in his *Nouvelle Héloïse* and by Byron in his *Childe Harold* and in the *Prisoner of Chillon*, while the names of Voltaire and of Madame de Staël are connected with Ferney and Coppet at the Geneva extremity, Gibbon's with Lausanne. The southern French shore rises solemn and stern, with the mountains of Savoy in the background. From the Lake of Geneva, Mont Blanc is visible, and although 60 miles distant, is often reflected in its waters. Mirages are sometimes observed on the lake. The Rhone enters the lake at the upper end, turbid and yellow, and leaves it at the town of Geneva as clear as glass, and of a deep blue tint. The lake receives about twenty unimportant streams along its northern shore.

Geneviève, the patron saint of Paris, was born about 424, in the village of Nanterre, near Paris, and took the veil in her fifteenth year. On the death of her parents she removed to Paris. She acquired an extraordinary reputation for sanctity, which was increased by her confident assurance that Attila and his Huns would not touch Paris, and by an expedition undertaken for the relief of the starving city during the Frankish invasion under Childeric, in which she journeyed from town to town, and returned with twelve ship-loads of provisions. In 460 she built a church over the tomb of St Denis (q.v.), where she was buried at her death in 512. See her Life by Saint-Yves (1845) and Lefeuve (new ed. 1861).

Genghis Khan, originally called Temujin, a celebrated Mongol conqueror, was born in 1162 at Deligun Bulduk on the river Onon (SE. of Lake Baikal), the son of a Mongol chief whose sway extended over great part of the region between the Amur and the Great Wall of China. Being called upon to rule his father's people when only thirteen years of age, Temujin had to struggle hard for several years, first against a confederacy of revolted tribes, then against different confederacies of hostile tribes and neighbouring rivals, whom his uninterrupted successes and rapidly-growing power had made jealous. The most critical period of his career at this juncture occurred during a war with Wang Khan, the powerful chief of the Keraits. Temujin, at first worsted, was compelled to retire to a desert region with only a few warriors; but in the following year (1203) he collected another army, and with it inflicted upon his enemy a crushing and decisive defeat. The Keraits thereupon became subject to Temujin. His ambition awakening with his continued success, the Mongol prince spent the next six years in subjugating the Naimans, a powerful Turkish confederacy who occupied the region between Lake Balkhash and the river Irtish; in conquering Hia or Tangut, a Chinese empire lying between the Desert of Gobi and Chaidam; and in assimilating the results of the voluntary submission of the Turkish Uigurs, from whom the Mongols derived the beginnings of their civilisation, as their alphabet and laws. It was during this period—viz. in 1206, that he adopted the title of Jenghiz or Genghis Khan, equivalent to 'Very Mighty Ruler.'

Bent upon yet more ambitious schemes, he in 1211 refused tribute to the Kin emperor of North China, and invaded and overran his country in several campaigns. About this same time, too, his attention was directed to the west: with comparatively little trouble he defeated the ruler of the Kara-Chitai empire, and annexed (1217) his country, which extended from Lake Balkhash to Tibet. His next undertaking was the most formidable of all, an attack upon the powerful empire of Kharezm, whose confines ran conterminous with the Jaxartes (Sihûn or Sir-Daria), Ferghana, the Indus, Persian Gulf, Kurdistan, Georgia, and the Caspian Sea. Entering this extensive country with three armies in 1218, the Mongol prince and his captains successively took, often by storm, the populous cities of Otrar, Sighnak, Aksi Khojend, Bokhara, and Samarcand, hunted down from one end of his territories to the other Mohammed, the ruler of Kharezm, and the princes of his family, captured Urgenj or Kharezm (now Khiva), devastated with most horrible cruelties and barbarities the beautiful and prosperous province of Khorasan and its cities (Nessa, Merv, Nishapur, and Herat), chased Jelal-ud-Din, son and heir of Mohammed, across the Indus into India, and finally returned home in 1225 by the way they had come. Two of Genghis' lieutenants, Chépé and Subutai, who had so relentlessly and pertinaciously hunted down Mohammed, passed on from the southern shore of the Caspian northwards through Azerbijan and Georgia, then, turning to the west, they traversed southern Russia and penetrated to the Crimea, everywhere routing and slaying, and finally returned by way of Great Bulgaria and the Volga, beyond the northern end of the Caspian—a marvellous military raid. Meanwhile in the far east Mukuli, one of the most capable amongst the group of the great conqueror's clever generals, had completed the conquest of all northern China (1217–23) except Honan.

Genghis did not long stay quietly at home. After but a few months' rest he again took to the saddle, to go and chastise the king of Hia or Tangut, who had refused him obedience. But this was his last expedition, for, after thoroughly subduing the country, Genghis died of sickness, on 18th August 1227, amongst the northern offshoots of the Kuen-Lun called the Mountains of Liupan. The rapidity and magnitude of his conquests seem to have been as much due to the admirable discipline and organisation of his armies as to the methods in which he conducted his campaigns. His troops were all horsemen, hardy, abstemious, inured to fatigue, indifferent to weather, accus-

toned to go days and nights in the saddle without resting. Thus the Mongol armies could move with extreme celerity, and needed little provisioning. They never left either enemy or strong town behind their backs to threaten their communications: all the former were ruthlessly slain or massacred, all the latter completely razed to the ground. The hard labour necessary in besieging the fortified cities was done by the peasantry of the country in which they were situated, and in the battles the same wretched people were frequently placed by the Mongols in the forefront of the fight to bear the brunt of their enemies' onset. Genghis was, however, something more than a warrior and conqueror; he was also a skilful administrator and ruler: he not only conquered empires stretching from the Black Sea to the Pacific, but he organised them into states which endured beyond the short span that usually measures the life of Asiatic sovereignties.

See Howorth, *History of the Mongols*, part 1 (1876); R. K. Douglas, *Life of Jenghiz Khan* (1877); and compare Erdmann, *Temudschin, der Unerschütterliche* (1862), and D'Ohsson, *Histoire des Mongoles* (1852).

Genii, among the ancient Romans, were protecting spirits, who were supposed to accompany every created thing from its origin to its final decay, like a second spiritual self. They belonged not only to men, but to all things animate and inanimate, and more especially to places, and were regarded as effluences of the Divinity, and worshipped with divine honours. Not only had every individual his genius, but likewise the whole people. The statue of the national genius was placed in the vicinity of the Roman forum, and is often seen on the coins of Hadrian and Trajan. The genius of an individual was represented by the Romans as a figure in a toga, having the head veiled, and the cornucopia or patera in the hands; while local genii appear under the figure of serpents eating fruit set before them. Quite different are the genii whose Arabic name, *Djinn* or *Jinn*, was translated by the Latin term *genius*, for want of a better word, or from the casual similarity of the sounds. See DEMONOLOGY, and FAMILIAR.

Genipap, *Genipa americana* (Cinchonaceæ), a large tree of the West Indies and warm parts of South America, with excellent fruit. The pearl-gray timber is occasionally used by joiners.

Genista (Celtic *gen*, 'a shrub'), a leguminous genus already mentioned under BROOM (see also GREENWEED). *G. anglica*, a small, much branched, very spiny shrub of poor soils, is called Petty Whin and Needle Furze in England. The *Genista* of Virgil and other Roman classics is supposed to be *G. hispanica*, of southern Europe, with branched stiff spines. The name Plantagenet is from *Planta Genista;* but what plant was intended, and whether the common broom, furze, or a species of Genista is not so certain. See PLANTAGENET.

Genitive. See GRAMMAR.

Genlis. STEPHANIE FELICITÉ DUCREST DE ST AUBIN, COMTESSE DE, was born at Champcéri, near Autun, in Burgundy, 25th January 1746. At the age of sixteen she was married to the Comte de Genlis, and in 1770 was made lady-in-waiting to the Duchesse de Chartres. In 1782 the Duc de Chartres, afterwards known as Égalité, appointed her 'governor' of his children, including Louis-Philippe. Madame de Genlis wrote a variety of works for her pupils, among others *Théâtre d'Éducation* (1779–80), a collection of short comedies; *Annales de la Vertu* (1781); *Adèle et Théodore, ou Lettres sur l'Éducation* (1782); and *Les Veillées du Château* (1784). On the breaking out of the Revolution Madame de Genlis took the liberal side, but was ultimately compelled to seek refuge (1793) in Switzerland and Germany. When Bonaparte became consul she returned (1799) to Paris, and received from him a pension. She died at Paris, 31st December 1830. Madame de Genlis's writings amount to about ninety volumes. Amongst them may be mentioned the romance *Mdlle. de Clermont* (1802), *Mémoires Inédits sur le XVIII. Siècle et la Révolution Française* (10 vols. 1825), and *Diners du Baron d'Holbach*. The last contains a great deal of curious but malicious information concerning the freethinkers of the 18th century. See Bonhomme's *Mme. de Genlis* (Paris, 1885).

Gennesaret, SEA OF. See GALILEE.

Genoa (Ital. *Genova*, Fr. *Gênes*, anciently *Genua*), a city of Italy, situated on the Mediterranean gulf of the same name, at the foot of the Apennines, is the capital of a province and the most important seaport. By rail it is 801 miles SE. of Paris, 171 NE. of Marseilles, and 93 SSW. of Milan. Pop. of the town (1881) 138,081; of the commune, 179,515; pop. of the commune in 1900, 237,490.

The slopes of the hills behind the city down to the shore are covered with buildings, terraced gardens, and groves of orange and pomegranate trees; while the bleak summits of the loftier ranges rising still farther back are capped with a line of strong forts, batteries, and outworks. The fine harbour, semicircular in shape, with a diameter of rather less than a mile, is protected seawards from the south and south-east winds by two piers. In front of this inner harbour another one has been made by the construction of two outer moles. Besides this, the quays of the inner harbour have been greatly improved, and in 1889 graving-docks and other works were completed. On the north side of the port is a naval harbour and a marine arsenal; and on the east side the warehouses of the former (until 1867) free port. Genoa is the commercial outlet for a wide extent of country, of which the chief exports are rice, wine, olive-oil, silk goods, coral, paper, macaroni, and marble. The imports are principally raw cotton, wheat, sugar, coal, hides, coffee, raw wool, fish, petroleum, iron, machinery, and cotton and woollen textiles. The annual exports of Genoa are valued at nearly £4,000,000, while the imports are returned at more than £15,000,000. About 5800 vessels, of 2,970,000 tons burden, enter annually, and about 5750 of 2,979,000 tons clear, three-fourths of the vessels, with nearly one-half of the tonnage in each class, being Italian. The principal industrial establishments of the city embrace iron-works, cotton and cloth mills, macaroni-works, tanneries, sugar-refineries, and vesta match, filigree, and paper factories. From 70,000 to 100,000 emigrants sail every year from Genoa for South America; in some years the number has been near 200,000.

While strikingly grand as viewed from the sea, and so far worthy of being entitled *Genova la Superba*, Genoa is in reality built awkwardly on irregular rising ground, and consists of a labyrinth of narrow and intricate lanes, accessible only to foot-passengers, or to the pack-mules by the use of which a large portion of the internal goods traffic is conducted. These thoroughfares, into which the light of day imperfectly penetrates, are lined with tall buildings, some of them of marble and of handsome architecture, but now in many cases transformed into hotels or business establishments. Of the palaces the most famous are the ducal palace formerly inhabited by the doges, now appropriated to the meetings of the senate; and the Doria, presented in 1529 to the great Genoese citizen Andrea Doria, whose residence it was during his presidency of the republic. The palaces Brignole-Sale, Reale,

Durazzo-Pallavicini, Spinola, Balbi-Senarega, and others possess great interest on account of their historical fame and architectural beauty. Many of them contain galleries of paintings; the Brignole-Sale has works by Van Dyck, Rubens, Albrecht Dürer, Paolo Veronese, Guercino, &c. Foremost amongst the churches stands the cathedral of St Lorenzo, a grand old pile in the Italian Gothic style, built in the 12th century and frequently restored. In the church of St Ambrogio (1589) are pictures by Guido Reni and Rubens, and in that of St Stefano an altar-piece by Giulio Romano; the interior of L'Annunziata is splendid with fine marbles and rich gilding. The marble municipal palace, built in the Late Renaissance style, with a magnificent vestibule, courtyard, and galleries, and the palace of the Dogana must also be mentioned. The university (790 students in 1886), originally built in 1623, reorganised in 1812, has a library of 116,000 volumes. Genoa is well supplied with technical schools and institutions for higher education. The great hospital, the asylum for the poor (provision for 2200 persons), the deaf and dumb institution, and the hospital for the insane are amongst the finest institutions of their kind in Italy. There are numerous excellent philanthropic foundations, as the Fieschi, an asylum for female orphans. Furthermore, we must mention the public library, containing 50,000 volumes; the Academy of Fine Arts, founded (1751) by the Doria family; the Carlo Felice Theatre, one of the finest in Italy; and the Verdi Institute of Music.

The Genoese are a shrewd, active, laborious race, and possess all the qualities of a commercial and maritime community. They make skilful and hardy seamen, and are still remarkable for the spirit of enterprise and freedom which so strongly characterised the period of the republic. To Columbus, Genoa's most famous son, there is a fine monument (1862) by Lanzio.

History.—Genoa, anciently the capital of Liguria, is first mentioned as a place of considerable importance in the second Punic war. Having been destroyed by Mago, brother of Hannibal, in 205, it was rebuilt three years later by the Roman prætor Sp. Lucretius. On the dismemberment of the Latin empire Genoa fell successively under the sway of the Lombards, the Franks, and the Germans; but amid all these vicissitudes it preserved, in a singular degree, both privileges and prosperity. At length it succeeded in establishing its independence as a republic. Even thus early commerce was the source of its power. The frequent incursions of the Saracens, by whom Genoa was sacked and pillaged in 936, led the Genoese to form an alliance with Pisa with the object of driving the aggressors from Corsica and Sardinia, their strongholds in the Mediterranean. This being effected (1017–21), the Genoese obtained, by papal arbitration, the grant of Corsica, while Sardinia was assigned to the Pisans, a distribution which sowed the seeds of future discord between the two states. At the close of the 11th century Genoa commanded large land and naval forces, and ranked as a powerful maritime state, governed by annual magistrates named consuls. The Genoese vigorously seconded the Crusades, and in return for their effective co-operation obtained several important maritime possessions and commercial privileges in the Holy Land (1109). The chief events of the three following centuries were the capture of Minorca (1146), Almeria (1147), and Tortosa (1148) from the Moors; the wars with Pisa and Venice; and the civil dissensions by which Genoa, in common with all Italy, became distracted by the Guelph and Ghibelline factions. In 1284, at the naval battle at Meloria the Pisan Republic sustained such destructive losses that her maritime influence and public spirit never revived. The wars with Venice originated about 1244 in mutual jealousies respecting the commercial supremacy in the Levant, and continued, with various vicissitudes, till the end of the following century, when the Genoese, after the blockade of Chioggia (1379), were compelled to submit to disadvantageous terms by the peace of Turin (1381).

Co-existent with this troublous external history, civil dissensions exhausted and demoralised the state, and occasioned an infinity of changes in the primitive form of government. In 1217 the consuls were superseded by a magistrate termed *podesta*, generally chosen from a foreign state, natives of Genoa being declared ineligible. During the next hundred years civil feuds raged inveterately, not alone between the Guelph and Ghibelline factions, but also between the patricians and the plebeians. Various other modifications of the government preceded the election of the first Genoese doge in 1339. This supreme magisterial office, from which all nobles were excluded, continued in force for two centuries, its tenure being for life. But even then matters did not improve much. Finally, in 1396, the citizens, in despair, invoked the protection of the French king, Charles VI., and, after alternating between France and Milan, at last submitted to the rule of the lords of Milan (1464). In 1407 was founded the bank of St George, which eventually became a very powerful association, not only financially but also politically. From the invasion of Milan by Louis XII. in 1499 Genoa remained subject to the French until, in 1528, the genius and resolution of Andrea Doria (q.v.) freed his country from foreign invaders, and restored to her her republican institutions. The Fieschi conspiracy, which had for its object the overthrow of Doria and the destruction of the French party amongst the nobles, was suppressed in 1547. The 17th century is marked by two wars against the Duke of Savoy (1631 and 1672) and the bombardment of the town by Louis XIV. (1684). The last important exploit of the Genoese was the expulsion in 1746 of the Austrians after an occupation of three months. In 1768 Genoa ceded to France the island of Corsica; and when Bonaparte invaded Italy he conferred (1797) on Genoa the name of the *Ligurian Republic*, which in 1802 was abolished, Genoa becoming the chief town of a department of France. In 1814 Lord Bentinck stormed the forts and captured the city, whereupon he restored the constitution which had existed previous to 1797. In 1815, by a decree of the Congress of Vienna, the state of Genoa was made a province of Piedmont. Following the fortunes of that state, it was finally incorporated in the kingdom of Italy. The opening of the St Gothard railway greatly increased the trade with Germany.

See J. T. Bent, *Genoa* (1880); Bella Duffy, *The Tuscan Republics* (1892), V. W. Johnson, *Genoa the Superb* (1892).

Genoa, GULF OF, a large indentation in the northern shore of the Mediterranean, north of Corsica, has between the towns of Oneglia on the west and Spezia on the east a width of nearly 90 miles, with a depth of about 30 miles.

Genre-painting. *Genre* (French, from the Latin *genus*, 'a kind') is a term in art which was originally used to indicate simply any class or *kind* of painting, and was always accompanied by a distinctive adjective or epithet, as *genre historique*, 'historical painting,' *genre du paysage*, 'landscape-painting.' The phrase *genre* or *genre*-painting, however, has now come to be applied to scenes from familiar or rustic life, to all figure-pictures which, from the homeliness of their subjects, do not attain to the dignity of 'historical' art. *Genre*-painting, in its most typical development,

may be studied in the interiors and rustic subjects of such Dutch figure-painters as Teniers, Ostade, De Hooch, Jan Steen, and Terburg. In France the most eminent *genre* painters were Watteau, Lancret, Greuze, and Chardin; while in England the works of Hogarth, Wilkie, Mulready, and the elder Leslie may be mentioned as belonging to this class.

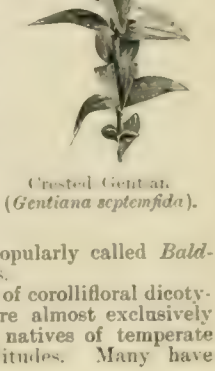
Gens. See FAMILY and TRIBE.

Genseric (more correctly Gaiseric), king of the Vandals, was an illegitimate son of Godigiselus, who led the Vandals in their invasion of Gaul, and perished with 20,000 of his followers in a defeat by the Franks (407 A.D.), who were only prevented from completely destroying the Vandals by the timely intervention of the Alans. In the year 409 the Vandals, with their friendly allies the Suevi and the Alans, poured over the Pyrenees into Spain, and shared its territory between them. The Vandals were divided into two branches, the Asdingi, who settled in Galicia, and the Silingi, who occupied Bætica in the south. The latter, after suffering crushing defeats from the Romans, joined the former under their king Gunderic, son of Godigiselus, whose nation soon became the most powerful in the Peninsula. Gunderic died in 427, and was succeeded by Genseric. Invited to the invasion of Africa by Bonifacius, Count of Africa, who had been goaded on to rebellion through the machinations of his rival Aetius, the conqueror of Attila, Genseric first crushed the Suevi, and, after numbering his united Vandals and Alans on the Andalusian shore, crossed over to Numidia in 428. Only when it was too late did Bonifacius repent his treacherous designs and attempt in vain to drive back the Vandals. After a thirteen months' siege, in the course of which the great St Augustine died, the city of Hippo Regius fell (430), and was given over to all the fury of wanton and brutal outrage. With such ferocity did the Vandals lay waste and destroy churches, fields, and cities as to leave their name after fourteen centuries a synonym for destructive barbarism. All Africa west of Carthage quickly fell into the hands of Genseric, who seized that city itself in 439, and made it the capital of his new dominions. He dated his reign, which lasted thirty-seven years, from this conquest.

With a capacity for adapting himself to new conditions which shows his genius, he quickly built up a formidable maritime power, and his fleets scoured the Mediterranean and carried the terror of his name to Sicily, the southern coasts of Italy, Illyricum, and the Peloponnesus. He next portioned out the soil of the province of Carthage among his soldiers, and settled the succession. A bigoted Arian in his theology, he persecuted the orthodox Catholics in his dominions with ferocious rapacity and cruelty. The murder of the great Aetius (454), and of his murderer and master Valentinian III., opened up a new field for his ambition. Eudoxia, the widow of Valentinian, eager for revenge upon her husband's murderer Maximus, invited Genseric to Rome. The Vandal fleet reached the mouth of the Tiber in June 455. The wretched Maximus had already fallen, and the city could offer no resistance; all Pope Leo's entreaties did not save it fourteen days of devastating plunder. On leaving the city Genseric carried with him the empress and her two daughters, one of whom became the wife of his son Huneric. The empire twice endeavoured to avenge the indignities it had suffered, but without success. First the Western emperor, Majorian, fitted out a fleet against the Vandals in 457, which was destroyed by Genseric in the bay of Carthagena; next, the Eastern emperor, Leo, sent an expedition under the command of Heraclius and others in 468, which was also destroyed off the city of Bona. Genseric died in 477, in the possession of all his conquests, leaving behind him the reputation of being the greatest of the Vandal kings. His appearance was not imposing: Jordanes describes him as of low stature, and lame on account of a fall from his horse, deep in his designs, taciturn, averse to pleasure, subject to transports of fury, greedy of conquest, and cunning in sowing the seeds of discord among nations, and exciting them against each other. He was ruthless in his cruelty, and seems to have found impulse in the fierce and fanatical bigotry of his religion. Once, when leaving the harbour of Carthage on an expedition, the pilot asked him whither he was going. 'Against all who have incurred the wrath of God,' said the conqueror.

Gentian (*Gentiana*—so called after the Illyrian king Gentius, who is said by Pliny to have introduced *G. lutea* into medicine), a genus of Gentianaceæ. There are more than 100 species, natives of north temperate regions, very often growing in high mountain pastures and meadows, which they cover with their beautiful blue or yellow flowers. The roots of the Common Gentian or Yellow Gentian (*G. lutea*) are collected by the peasants of the Alps (along with the less valuable roots of *G. pannonica*, *purpurea*, and *punctata*) to furnish the gentian root (*radix gentianæ*) of pharmacy, which is largely employed as an excellent bitter and stomachic. The medicinal properties are essentially due to the presence of a bitter glycoside (*gentiopicrin*); pectin (see FRUIT) and also sugar are present in quantity; hence the peasants of the Alps prepare alcoholic bitters—their *Enziangeist*—by the fermentation of the fresh roots. *G. Catesbæi* is used as gentian root in North America, and *G. Kurroo* in the Himalayas.

The florist recognises two main groups of these beautiful hardy plants, the first strong and easily grown in borders, of which the Willow Gentian (*G. asclepiadea*) and *G. lutea* are specially common. The former can also be grown with good effect under trees and among grass. The dwarf kinds require more careful treatment, with the exception of the Common Gentianella (*G. acaulis*), which readily forms edgings and carpets. The name Gentianella is sometimes also applied to the allied *Cicendia filiformis*, a small, slender, and graceful plant with yellow flowers. *G. verna* (Vernal Gentian) can be grown well in deep sandy loam, with abundant moisture and sunshine. Bavarian Gentian (*G. bavarica*) and Crested Gentian (*G. septemfida*) of the Caucasus require more moisture. Other species can be cultivated with care. Of North American species *G. crinita* is specially celebrated for the beauty of its flowers; the genus in fact may fairly be allowed the very first place among the floral glories alike of Alpine regions, in which they range up to the snow-level, and of the alpine garden. Several species of Gentian are popularly called *Baldmoney*. See ALPINE PLANTS.



Crested Gentian (*Gentiana septemfida*).

Gentianaceæ form an order of corollifloral dicotyledons. The 500 species are almost exclusively herbaceous, and are usually natives of temperate and cold latitudes and altitudes. Many have

flowers of great beauty, and a general astringency pervades the order, whence many are of past or present medicinal repute. See CHIRATA, BUCKBEAN, and CENTAURY.

Gentile (Lat. *gentilis*, from *gens*, 'a nation'), in Scripture, a member of a non-Jewish nation, an alien, an unbeliever, a non-Christian. The Heb. *goim*, pl. of *goi*, 'nation,' is used both of foreigners in general and foreigners as enemies, as heathens; so in the New Testament the Greek *ethnē*, 'nations,' and *Hellēnes*, 'Greeks,' though sometimes meaning simply foreigners, non-Jews, usually had the invidious sense of unbeliever, heathen. Compare the Greek use of Barbarian (q.v.).

Gentile da Fabriano. See FABRIANO.

Gentilly, a southern suburb of Paris, on the circular railway, at the foot of the Bicêtre hill. It has a number of villas, tanneries, and manufactures of biscuits, vinegar, mustard, and soap. Pop. (1891) 15,017, many of them employed in the neighbouring quarries and in washing.

Gentleman, in its original and strict sense, a person of noble descent. The first part of the word comes from the Latin *gentilis*, which signifies belonging to a *gens* or family. The terms gentleman and nobleman were formerly identical in meaning; but the popular signification of each has become gradually modified, that of the former having widened, of the latter having become more restricted. The continental *noble* (Fr.) or *adel* (Ger.) still retains the original sense of our gentleman. The broadly-marked distinction between the nobleman or gentleman and the rest of the community is one of the most prominent features of medieval life, and the source from which the less abrupt gradations of rank in modern society have been developed. The gentry of England had formerly many privileges recognised by law. If a churl or peasant defamed the honour of a gentleman, the latter had his remedy in law, but if one gentleman defamed another, the combat was allowed. In equal crimes a gentleman was punishable with less severity than a churl, unless the crime were heresy, treason, or excessive contumacy. A gentleman condemned to death was beheaded and not hanged, and his examination was taken without torture. In giving evidence the testimony of a gentleman outweighed that of a churl. A churl might not challenge a gentleman to combat, *quia conditiones impares*. After the introduction of heraldry the right to armorial ensigns or *insignia gentilitia* became (as the *jus imaginum* had been among the Romans) the test of gentility or nobility. Gentility was of course inherited; but it was also within the prerogative of a sovereign prince to ennoble or make a gentleman of a person of a lower grade whom he thought worthy of the distinction, and whose descendants accordingly became gentlemen. We have examples in England of the direct exercise of this prerogative by the sovereign as late as the reign of Henry VI., the patent of gentility or nobility being accompanied with no title of honour, but merely with a coat of arms, the grant containing the words '*nobilitamus nobilemque facimus et creamus . . . et in signum hujusmodi nobilitatis arma et armorum insignia damus et concedimus.*' Letters of nobility of a similar description are granted by the emperor in Germany and Austria to the present day, conferring no title, but only the status of *adel* (nobleman or gentleman) indicated by the prefix *von* to the surname. A gentleman of ancestry was (or is) something beyond a gentleman of blood and coat-armour: he must be able to show purity of blood for five generations—i.e. that his ancestors on every side for four generations back—viz. his eight great-great-grandfathers and eight great-great-grandmothers—were all entitled to coat-armour. This purity of blood is still insisted on for certain offices in Germany and Austria. In England the concession of *insignia gentilitia* (or of creating a gentleman) has long been deputed to the kings of arms, the prerogative of the sovereign in the matter of rank being directly exercised only in creating peers, baronets, or knights. In our own day, while the stricter meaning of the word is retained in the expression 'gentleman by birth,' the less abrupt gradation of ranks and the courtesy of society have caused the term gentleman to be applied in a somewhat loose sense to any one whose education, profession, or perhaps whose income, raises him above ordinary trade or menial service, or to a man of polite and refined manners and ideas. See ESQUIRE, NOBILITY.

Gentleman-commoner. See OXFORD (*University*).

Gentlemen-at-arms (formerly called the GENTLEMEN-PENSIONERS), the bodyguard of the British sovereign, and, with the exception of the yeomen of the guard, the oldest corps in the British service. It was instituted in 1509 by Henry VIII., and now consists of 1 captain, who receives £1200 a year; 1 lieutenant, £500; 1 standard-bearer, £310; 1 clerk of the cheque, £120; and 40 gentlemen, each with £70 a year. The pay is issued from the privy purse. Until 1861 the commissions were purchasable, as in other regiments; but by a royal command of that year this system was abolished, and commissions as gentlemen-at-arms have since only been given to military officers of service and distinction. The attendance of the gentlemen-at-arms is only required at drawing-rooms, levées, coronations, and similar important state ceremonies. The appointment, which is in the sole gift of the crown, on the recommendation of the commander-in-chief, can be held in conjunction with half-pay or retired full-pay, but not simultaneously with any appointment which might involve absence at the time of the officer's services being required by the sovereign.

Gentoo' (Portuguese *Gentio*, 'Gentile'), the term applied by old English writers to the Hindus, or natives of India; and in especial to the *Gentoo* laws, a code compiled by Sir William Jones.

Gentz, FRIEDRICH VON, politician and writer, was born at Breslau, 2d May 1764, and, shortly after entering the Prussian civil service, published his first work, a translation of Burke's *Essay on the French Revolution* (1793). In 1786 he entered the public service of Prussia, but in 1802 exchanged into that of Austria, having a short time previously paid a visit to England, where he became acquainted with Mackintosh, Grenville, Pitt, and other public men. Throughout the struggle against Napoleon he distinguished himself by writings full of burning hatred to the French emperor. At the Congress of Vienna in 1814 Gentz was appointed first secretary, and he held the same post in nearly all the subsequent conferences down to that of Verona (1822). From 1810 onwards he laboured as an adherent of Metternich. His writings, which are of a miscellaneous character, are distinguished for the elegance and correctness of their style. But his pen was always on sale to the highest bidder; and he drew the supplies by which he met his lavish private expenditure from more than one government outside Austria. He died 9th June 1832. See his Life by K. Mendelssohn-Bartholdy (1867).

Genuflexion, the act of bending the knees in worship or adoration. It is of frequent occurrence in the ritual of the Catholic Church: Catholics genuflect passing before the tabernacle where the

sacrament is reserved; the priests genuflect repeatedly during mass, &c. See KNEELING.

Genus (Lat., 'a kind'), in Natural History, a group of Species (q.v.) closely connected by common characters or natural affinity. In all branches of zoology and botany the name of the genus forms the first part of the scientific name of each organism, and is followed by a second word—either an adjective or a substantive—which distinguishes the particular species. This binomial nomenclature was introduced by Linnæus, and has been of great advantage, making names serve, in some measure, for the indication of affinities.

Some genera are more satisfactory than others, the question turning on the nature of the component Species (q.v.). A genus may contain a single species—e.g. the genus Ornithorhynchus; or it may include several hundreds, and in such cases especially it is often split up into sub-genera. Groups of related genera form a *family*, groups of allied families form an *order*, and above orders are *class* and *phylum*. But, again, we may have an order with only a couple of living representatives, as in Proboscidea (elephants), or with only one, as in the Hyracoidea (conies). The real difficulties concern species, and will be discussed under that title. See also GENERALISATION.

Genzano, a town of Italy, on the Via Appia, 16 miles SE. of Rome, lies near the lake of Nemi, and contains the Cesarini palace. It is noted for its annual flower festival (*Infiorata di Genzano*), held on the eighth day after Corpus Christi, which attracts many visitors. Pop. 5291.

Geocentric means having the earth for centre. Thus, the moon's motions are geocentric; also, though no other of the heavenly bodies revolves round the earth, their motions are spoken of as geocentric when referred to, or considered as they appear from, the earth. The geocentric latitude of a planet is the inclination to the plane of the ecliptic of a line connecting it and the earth; the geocentric longitude being the distance measured on the ecliptic from the first point of Aries to the point in the ecliptic to which the planet as seen from the earth is referred.

Ge'odes (Gr., 'earthy') are rounded hollow concretions, or indurated nodules, either empty or containing a more or less solid and free nucleus, and having the cavity frequently lined with crystals. They are sometimes called 'potato stones,' on account of their size and shape. They were the *aëtites* ('eagle-stones') of the Greeks, who asserted they were found only in eagles' nests. The eagles could not breed without their aid, and the aëtites were supposed to be beneficial to women in labour.

Geo'desy, the science of measuring or surveying extensive portions of the earth's surface by triangulation (see ORDNANCE SURVEY). The objects of the survey are generally to determine the contour and dimensions of the earth, and in a secondary degree to acquire materials and measurements for accurate maps.

Geoffrey of Monmouth, a famous Latin chronicler, who was Archdeacon of Monmouth, was consecrated Bishop of St Asaph in 1152, and died about 1154. His chief work, the *Chronicon sive Historia Britonum*, was dedicated to Robert, Earl of Gloucester, and must therefore have been composed previous to 1147, the date of the latter's death. It need hardly be said that it possesses little value as history, but there is perhaps but one other book that has exercised, directly or indirectly, so profound an influence upon English literature. Its author professes to have merely translated his work from a chronicle entitled *Brut y Brenhined*, a History of the Kings of Britain, found in Brittany, and communicated to him by Walter Calenius, Archdeacon of Oxford; but the work is really nothing more than a masterpiece of the creative imagination working freely on materials found in Gildas, Nennius, and such chroniclers, as well as early legends now difficult to trace. In the dedicatory epistle Geoffrey describes his original as 'a very ancient book in the British tongue, which in a continued regular story and elegant style related the actions of them all, from Brutus, the first king of the Britains, down to Cadwallader the son of Cadwallo.' An abridgment of the *Historia* was made by Alfred of Beverley as early as 1150, and it was translated into Norman-French by Geoffrey Gaimar in 1154, and by Wace (*Li Romans de Brut*) with new matter in 1180. Layamon's *Brut* (early in 13th century) was a semi-Saxon paraphrase of Wace, and Robert of Gloucester's *Chronicle* was a fresh rhymed paraphrase of the same, which being in the native tongue helped to make the legends invented by Geoffrey widely known. The convincing circumstantiality of the story, and the ingenuity of its etymological connection of existing place-names with eponymous heroes, as well as its irresistible identifications and dovetailings into British history of details of scriptural and of Roman story were sufficient for an uncritical age; and henceforward the Trojan origin of the British people became a point of patriotism and an established historical fact. The stories of King Lear and of Cymbeline, the prophecies of Merlin, and the legend of the famous Arthur in the form in which we know it, owe their origin to the rich imagination of Geoffrey of Monmouth, who still influences us enormously in our Malory, Drayton, Shakespeare, Spenser, Milton, and Tennyson. Chaucer gives 'Englyssh Gaunfride' a niche in his *House of Fame* as being 'besye for to bere up Troye.' Yet the book, even in its own day, did not altogether escape the censure of more severe historians. A Yorkshire monk, William of Newburgh, denounces Geoffrey with honest indignation as having 'lied saucily and shamelessly.' 'A certain writer has come up in our times to wipe out the blots on the Britons, weaving together ridiculous figments about them, and raising them with impudent vanity high above the virtue of the Macedonians and Romans. This man is named Geoffrey, and has the by-name of Arturus, because he cloaked with the honest name of history, coloured in Latin phrase, the fables about Arthur, taken from the old tales of the Bretons, with increase of his own.' Giraldus Cambrensis, writing within fifty years after, distinctly speaks of the book as fabulous, and gives us a somewhat singular but perfectly conclusive proof of this by relating the story of a Welshman at Caerleon named Melerius, who, 'having always an extraordinary familiarity with unclean spirits, by seeing them, knowing them, talking with them, and calling each by his proper name, was enabled through their assistance to foretell future events. . . . He knew when any one spoke falsely in his presence, for he saw the devil as it were leaping and exulting on the tongue of the liar. . . . If the evil spirits oppressed him too much, the Gospel of St John was placed on his bosom, when, like birds, they immediately vanished; but when that book was removed, and the History of the Britons by Geoffrey Arthur was substituted in its place, they immediately reappeared in greater numbers, and remained a longer time than usual on his body and on the book.'

Geoffrey's *Chronicle* was printed as early as 1508. An English translation by Aaron Thompson appeared in 1718, and was issued in Bohn's 'Antiquarian Library' in 1848.

Geoffrin, MARIE THÉRÈSE, born at Paris, 2d June 1699, was the daughter of a valet de chambre named Rodet, a native of Dauphiné; and in her

fifteenth year was married to a very rich citizen in the Faubourg St Antoine, who died not long after, leaving her an immense fortune. Madame Geoffrin, though herself but imperfectly educated, had a genuine love of learning and art, and her house soon became a rendezvous of the men of letters and artists of Paris. Every illustrious foreigner was welcomed to her circle, but her dearest friends were the *philosophes*, and upon them in their necessities she showered her money with equal delicacy and liberality. Among her friends she numbered Montesquieu, Marmontel, Morellet, Thomas, and Stanislaus Poniatowski, afterwards king of Poland. The last is said to have announced to her his elevation to the throne in the words: 'Maman, votre fils est roi.' In 1766 he prevailed on her to visit Warsaw, where she was received with the greatest distinction, and subsequently in Vienna she met the same reception from the Empress Maria Theresa and her son, Joseph II. Madame Geoffrin died in October 1777, leaving legacies to most of her friends. Towards the publication of the *Encyclopédie* she contributed, according to the calculations of her daughter, who was no friend to her mother's pet philosophers, more than 100,000 francs. The panegyrics of D'Alembert, Thomas, and Morellet are to be found in the *Éloges de Madame Geoffrin* (1812). Morellet likewise published her treatise *Sur la Conversation*, and her *Lettres*.

Geoffroy Saint-Hilaire, Étienne, French zoologist and biologist, was born at Étampes (Seine-et-Oise), 15th April 1772. He was at first destined for the clerical profession, but shortly after beginning his studies at Paris he came into contact with Brisson, who awakened in him a taste for the natural sciences. He subsequently became a pupil of Haüy, Fourcroy, and Daubenton. In June 1793 he was nominated professor of Vertebrate Zoology in the newly-instituted Museum of Natural History at Paris. That same year he commenced the foundation of the celebrated zoological collection at the Jardin des Plantes. The year 1795 is marked by his introduction to his subsequent friend and scientific opponent, Georges Cuvier. In 1798 Geoffroy formed one of the scientific commission that accompanied Bonaparte to Egypt, and he remained in that country until the surrender of Alexandria in 1801. He succeeded in bringing to France valuable collections of natural history specimens; his labours in connection with this expedition led to his election, in 1807, into the Academy of Sciences. In 1808 he was sent by Napoleon to Portugal, to obtain from the collections in that kingdom all the specimens which were wanting in those of France. On his return he was appointed (1809) to the professorship of Zoology in the Faculty of Sciences at Paris. All his important works were published between this date and his death, which took place on 19th June 1844. Throughout almost all his writings we find him endeavouring to establish one great proposition—viz. the unity of plan in organic structure (see Evolution, Vol. IV. p. 481). This was the point on which he and Cuvier mainly differed, Cuvier being a firm believer in the invariability of species, and grouping the Linnean genera under the four divisions of vertebrates, molluscs, articulates, and radiates. Geoffroy also raised teratology or the study of monstrosities and anatomical malformations to the rank of a science, principally in his *Philosophie Anatomique* (2 vols. 1818–20). In addition to this he wrote *Sur l'Unité de Composition Organique* (1828); *L'Histoire Naturelle des Mammifères* (1820–42) with F. Cuvier; *Philosophie Zoologique* (1830); *Études Progressives d'un Naturaliste* (1835); besides numerous papers, mostly on comparative anatomy, scattered through magazines. See Life (1847) by his son Isidore, which contains a bibliography of his works; also the Appendix to vol. i. of De Quatrefages's *Rambles of a Naturalist* (1863).

His son Isidore, biologist and naturalist, was born in Paris, 16th December 1805. Educated in natural history by his father, he became assistant-naturalist at the zoological museum in 1824. He too made a special study of teratology, publishing in 1832–37 *Histoire des Anomalies de l'Organisation chez l'Homme et les Animaux*. As zoological superintendent he was led to study the domestication of foreign animals in France; and the results of his investigations appeared in *Domestication et Naturalisation des Animaux Utiles* (1854); in the same year he founded the Acclimatisation Society of Paris. In 1838 he proceeded to Bordeaux to organise a faculty of sciences. On the retirement of his father three years later, Isidore was appointed to the vacant chair, which in 1850 he resigned for that of Zoology at the Faculty of Sciences. In 1852 he published the first volume of a great work entitled *Histoire Générale des Règnes Organiques*, in which he intended to develop the doctrines of his father, but he died at Paris, 10th November 1861, before completing the third volume. He was a strong advocate of the use of horse-flesh as human food, and championed his views in *Lettres sur les Substances Alimentaires, et particulièrement sur la Viande de Cheval* (1856).

Geognosy (Gr. *gē*, 'the earth;' *gnōsis*, 'knowledge'), the study of the materials of the earth's substance, is a term now superseded by *Petrography*. See Geology.

Geographical Distribution. There is no branch of scientific inquiry the interest and importance of which have grown more rapidly in recent years than that which forms the subject of the present article. In chief measure this is due to the totally different complexion given to the inquiry by the publication of the Darwinian views of the Origin of Species. As long as it was held that each species must have been created, as a general rule, within the geographical area which it now occupies, the most curious facts of distribution could be regarded only with 'sterile wonder.' But when the idea came to be entertained that allied species have had a common origin, it was obviously implied that they or their ancestors must have had a common birthplace; and consequently, when we find members of a group severed from their nearest kindred, we feel bound to inquire how this came about. Thus, when it is observed that all the West Indian mammals, with one exception, are allied to those of America, we at once infer that the ancestors of these animals must have been derived from that continent, and we have to determine how the passage was made from the mainland to the islands; and the problem becomes much more difficult when we find that the single exception referred to 'belongs to an order, Insectivora, entirely absent from South America, and to a family, Centetidæ, all the other species of which inhabit Madagascar only' (Wallace, *Geographical Distribution of Animals*). Similarly, we have to explain how the tapirs are confined to the Malayan region and South America; the Camelidæ to the deserts of Asia and the Andes; marsupials to the Australian region and America; how the mammals and birds of North America resemble those of Europe more than those of South America; how the flora of Japan presents greater affinities to that of the Atlantic than to that of the Pacific States of North America; and so on.

The considerations that must be taken into account in dealing with the problems of distribution are far too numerous and complex to be gone into fully within the limits of an encyclopædia article, and all that can be done under this head is

to indicate the nature of the more important facts affecting the solution of these problems. One of the principal means of throwing light on this subject must obviously be to consider by what means animals and plants are able to disperse themselves across the barriers at present existing.

It is scarcely necessary to draw attention to the facilities for diffusion possessed by animals endowed with great locomotive powers, and especially, among land-animals, by those having the power of flight; and in connection with this means of dispersal the most important thing to note is that some animals, which in the adult state have only feeble powers of locomotion, are better endowed in this respect in an earlier stage of existence. Such, for example, are univalve and bivalve marine molluscs, which are all developed from free-swimming larvæ.

But, besides the normal means of locomotion, there are many other modes of dispersal which it is highly important, with reference to the present inquiry, to take into account. First, there is the power of winds as a distributing agent. The carrying power of winds is known to be sufficient to bear along in the air fine dust across seas many hundreds of miles in width; and, that being the case, we have in that agency alone an adequate means of accounting for the dispersion of all plants propagated by minute spores. For that reason the distribution of most cryptogamic plants hardly forms part of the problem under consideration, and is generally left out of account by those who have devoted themselves to this investigation. What part winds may have played in carrying the seeds of phanerogamous plants across arms of the sea is a more doubtful point; but there are observations which show that even for such seeds, especially when provided with some kind of feathery appendage, winds may occasionally serve as a means of transport for very long distances. Thus, Berthelot records that after a violent hurricane he saw an annual belonging to the Compositæ (*Erigeron ambiguus*), widely distributed throughout the Mediterranean region, suddenly appear at various spots on the Canary Islands, where it was previously unknown, so that there could be hardly any doubt that the seeds had been blown across from Portugal or North Africa. Nevertheless, De Candolle has shown that seeds provided with a pappus are not on an average more widely distributed than those members of the Compositæ which are not so provided, so that such a case as that just mentioned must be looked upon as quite exceptional. But it is exceptional means of transport that is most important to consider with reference to the problems of distribution.

But, in the case of animals also, winds are a more important means of transport than one might at first suppose. Birds and insects are often blown immense distances out of their course; and to this cause, for instance, is due the arrival every year of American birds on the Bermudas. Insects have been caught on board of ships upwards of 300 miles from land. Further, there are well-authenticated cases of even crabs, frogs, and fishes being carried long distances by storms; and in this way it is possible to account for the transference of fish, &c. from one river-system to another. Still more frequently, in all probability, are the eggs of such creatures transported by this means.

Next, marine currents also form, beyond doubt, a highly important means of dispersal both for plants and animals, and that in various ways. First, seeds may float on the surface of the ocean, and be carried by currents for hundreds of miles, and become stranded on a distant shore still in a condition fit for germination. The well-known experiments of Darwin to determine the vitality of seeds in sea-water first enabled us to appreciate the importance of this factor in the distribution of plants. In one experiment he found that, out of 87 kinds of seeds, 64 germinated after an immersion of 28 days, and a few survived an immersion of 137 days; and in another, that, out of 94 dried plants, 18 floated for above 28 days; and, combining the results of the two experiments, he concluded that 14 plants out of every 100 in the flora of a country might be floated by currents moving at the average rate of the several Atlantic currents a distance of 924 miles, and might, on being stranded, furnish seeds capable of germinating.

But further, marine currents often carry on their surface various kinds of natural rafts, which may be the means of transport both for plants and animals. In the polar regions icebergs and ice-floes may serve this purpose; and elsewhere trunks of trees, and even fragments torn from the land. Such fragments, forming small islands with erect trees upon them, have been seen at a distance of 100 miles from the mouth of the Ganges and other rivers. Wallace points out that ocean waifs of one kind or another are almost the only means we can imagine by which land-shells can have acquired the wide distribution for which they are remarkable. These molluscs perish very readily in sea-water, but, on the other hand, are very tenacious of life in other circumstances; and this tenacity of life obviously favours their chance of being carried in chinks of floating timber, or otherwise, across the ocean.

Again, locomotive animals are very frequently the means of dispersing both plants and other animals. Seeds may be attached to the fleece or fur of mammals or the plumage of birds, or may be enclosed in clumps of earth clinging to the feet or some other part of bird or beast, even of insects. To Darwin we are again indebted for an instance showing how likely a means of transport this is. He informs us that he received from Professor Newton the leg of a red-legged partridge (*Caccabis rufa*) with a ball of hard earth weighing 6½ ounces adhering to it. The earth had been kept for three years; but when broken, watered, and covered by a bell-glass, as many as eighty-two plants sprang from it. Hooked fruits, such as those of agrimony, geum, &c., and fruits covered with a viscous substance, like those of some thistles, mistletoe, and others, are the most likely to be transported in this way. It seems probable that aquatic birds and water-beetles have been the means of distributing aquatic plants and fresh-water molluscs, which are remarkable for their wide diffusion; and the spawn of amphibians and fresh-water fishes may be conveyed from one body of fresh water to another by the same means.

Again, seeds with hard shells are known in many cases to be capable of passing through the digestive organs of birds uninjured; and consequently fruits enclosing such seeds, or, like the strawberry, covered with them, may be devoured by birds in one place, and deposited by them in a state fit for germination at another, hundreds of miles distant. And what is of still more importance, seeds which would be destroyed if they passed through the digestive organs of a bird are quite uninjured as long as they remain in the crop, where they may be retained for twelve or eighteen hours; and thus birds killed with food in their crop may be the means of scattering seed which has travelled 500 miles. It is obvious that the migratory habits of certain birds are of great importance with reference to both the means of transport just mentioned. Some seeds retain the power of germination even after passing through the digestive organs of ruminants. There is a well-established case of a tree belonging to the order Leguminosæ having been introduced into the West Indies through cattle brought from

South America, the cattle having been fed on the voyage with the pods belonging to the tree.

Further, the parasitic habits of certain animals enable them to be carried about from place to place, when they have themselves no power, or only a very feeble power of locomotion. And, with regard to the subject now under consideration, it makes no difference whether the animals are truly parasitic, feeding at the expense of the host to which they are attached, or merely commensalists, gaining their own food independently, like the sea-anemones so frequently attached to the shells of hermit-crabs.

Lastly, man is often unintentionally the means of conveying both plants and animals from one region to another. The foreign plants found growing on ballast-heaps are instances of this, and so also are the plants which have sprung from seed introduced with imported grain or other articles of import. Since the discovery of America the whole of the northern part of the continent is said to have been more or less overrun by European weeds; and, according to Agassiz, the roadside weeds of the New England states, to the number of 130, are all European. Wherever European sailors have gone, the European rats, both black and brown, have accompanied them; and the shrew, the death's-head moth, the *Sphinx convolvuli*, &c., are also known to have been introduced into various countries in ships.

In the preceding summary of the more important means of diffusion for plants and animals, some of the obstacles to diffusion have been incidentally referred to; but it will be convenient to make a general survey of these also.

For all land-plants and land-animals the most obvious and effective barrier is a wide expanse of ocean; and where the expanse is very wide it is seldom passable except with the aid of man. For land-mammals the ocean is an absolutely impassable barrier, and hence native mammals are always absent from oceanic islands (i.e. islands that have never been connected with the mainland); and this barrier is almost equally effective for serpents and amphibians, which also are nearly always wanting where there are no native mammals. Lizards are more frequently found indigenous on oceanic islands, though their means of transit from the mainland is unknown. Arms of the sea and broad rivers are likewise generally impassable for the creatures mentioned, though some of them have greater powers of swimming than is generally supposed. The jaguar, the bear, and the bison are capable of swimming the widest rivers; pigs have been known to swim ashore when carried out to sea to a distance of several miles; and even a boa constrictor, it is said, has swum to the island of St Vincent from the South American coast—a distance of 200 miles.

Mountains, and especially high mountains, are also frequently effective barriers to the migration of land plants and animals; but it must be noticed that in some cases they serve for both as a means of communication between one region and another, enabling plants and animals belonging to a cold climate, for example, to spread into latitudes where, in the plains, the climate is too hot for them. Again, deserts act as a barrier to the majority of plants and animals; forests are a barrier to the camel, hare, zebra, giraffe, &c.; treeless regions to apes, lemurs, and many monkeys; plains to wild goats and sheep. Broad rivers also act occasionally as barriers to distribution, and that, strange to say, even in the case of some species of birds.

Another important barrier is that of climate; but, with reference to this, it must be observed that the question of climate affects the problems of geographical distribution, in the proper sense of that term, only in so far as climatic conditions may shut off plants and animals from means of communication between one region and another, and not where climate merely limits the range of a species or group within a continuous area. In the case of many animals climate acts only indirectly as a barrier through limiting the food-supply required by them.

Another set of barriers may be classed under the general head of organic, inasmuch as they are all connected with the vegetable or animal life of the region where such barriers exist. Under this head may be mentioned first the fact that certain animals require for their subsistence a special kind of vegetable food. The range of insects is peculiarly liable to be limited in this way, certain insects being attached to particular species of plants, and others to genera or families; and for this reason insects, in spite of the exceptional facilities for dispersal which, as we have already seen, they enjoy, are remarkable, as a rule, rather for the restriction of their areas of distribution than for their wide diffusion. Again, the presence of enemies is sufficient in some cases absolutely to exclude certain forms from certain areas, as the well-known tse-tse fly does horses, dogs, and cattle from a well-defined area in South Africa; and another kind of fly prevents horses and cattle from running wild in Paraguay, as they do in abundance both to the north and south of that region.

But a more important, because more generally operative, organic barrier consists in the fact of a region being already fully occupied by a native flora and fauna, so that there is no room for new-comers. Hence it happens that seeds may be wafted in plenty from one country to another without a single plant growing from these seeds being able to establish itself; and there may even be, as in South America, a free communication with another region while the fauna remains strikingly distinct, simply because that portion of the American continent is already completely stocked with a fauna perfectly adapted to the physical conditions there prevailing.

The barriers to the spread of marine creatures are not so numerous as in the case of terrestrial forms. The freedom of communication between one part of the ocean and another makes it impossible to mark out any marine zoogeographical regions, though many seas and coasts are distinguished by characteristic fishes and other marine creatures. The principal barriers for fish are temperature and the intervention of land. Thus, the Isthmus of Panama is at present a complete barrier for fishes requiring warm seas.

If all the barriers to migration had existed in all past time as they are now, it would be quite impossible to explain the present distribution of plants and animals on the supposition that kindred groups have had a common birthplace. But the solution of the problems of distribution is to be found in the fact that all the barriers are liable to change. Of changes of sea and land geology supplies us with abundant evidence. Portions of the mainland now continuous were at one time severed by arms of the sea; and islands have been formed by the severance of portions of land that once belonged to the mainland. Such islands are known as continental islands, and the study of their faunas and floras is one of peculiar interest in connection with geographical distribution. These faunas and floras show, as might be expected, a greater or less degree of correspondence with those of the mainland from which the islands have been cut off; and the resemblance is the closer the more recently the land connection has been destroyed. The relative date of the disunion is usually approximately indicated by the depth

of the sea which now separates island and mainland, shallow seas dividing portions of land that have only recently been disconnected, and deeper seas separating those which have been longer apart.

The most remarkable case of isolation is presented by the Australian region, the fauna and flora of which are the most peculiar in the world. In the widest sense, this region includes not only the vast island of Australia itself, but also New Guinea and all the Malayan and Pacific islands to the east of a deep channel between the islands of Bali and Lombok—a channel the significance of which, as a boundary line for plants and animals, was first pointed out by Wallace, the great authority on animal distribution, and hence known as Wallace's Line. The great feature of this region (so far as animal distribution is concerned) is 'the almost total absence of all the forms of mammalia which abound in the rest of the world, their place being taken by a great variety of marsupials.' The family just mentioned, though now restricted in the manner stated at the beginning of this article, was at one time spread over the whole world, but has in most parts become extinguished by the competition of later types; thus presenting one of the best examples of what are known as discontinuous areas of distribution, and offering an illustration of the mode in which such discontinuity is usually brought about. The early severance of the Australian region from the Asiatic continent (a severance which must be referred to some period in the Secondary Age of geologists) saved the Australian marsupials from the competition which almost extinguished the group elsewhere.

Turning now to marine distribution, we find evidence of the former absence of a land-barrier at the Isthmus of Panama in the identity of many species of fish on both sides of the isthmus.

The Zoogeographical Regions according to A. R. Wallace:

Sub-regions of Palæarctic Region—
1. European.
2. Mediterranean.
3. Siberian.
4. Manchurian.

Sub-regions of Ethiopian Region—
1. East African.
2. West "
3. South "
4. Malagasy.

Sub-regions of Oriental Region—
1. Indian.
2. Ceylonese.
3. Indo-Chinese.
4. Indo-Malayan.

Sub-regions of Australian Region—
1. Austro-Malayan.
2. Australian.
3. Polynesian.
4. New Zealand.

Sub-regions of Neotropical Region—
1. Chilian.
2. Brazilian.
3. Mexican.
4. Antillean.

Sub-regions of Nearctic Region—
1. Californian.
2. Rocky Mountain.
3. Alleghanian.
4. Canadian.

Changes in the climatic barrier have also had an important influence on geographical distribution; and it is by such changes, combined with changes in the continuity of land in the north polar regions, that the affinities between the floras of Japan and eastern North America must be explained. When these affinities were first pointed out by Asa Gray, that distinguished botanist divined the true explanation—viz. that in former geological epochs a genial climate must have prevailed even within the polar circle, so as to allow of the existence of a remarkably uniform flora, suitable to such a climate, all round the pole in very high latitudes; and that as the climate became colder in the north this flora was driven southwards, and became differentiated according to the differences of climate in the more southerly latitudes to which it advanced. Hence the eastern parts of America and Asia, as they correspond pretty much in climate, came to correspond also more closely than other tracts in the same latitude in the character of their floras. The soundness of this surmise was afterwards confirmed by the discovery of abundant plant remains of the Miocene age, indicating a warm climate in Greenland, Spitzbergen, and elsewhere. The effects on distribution of the changes of climate belonging to the period known as the Glacial Period (q.v.) or Ice Age must be alluded to here, but there is no space to do more.

As the result of all the processes of dispersal across the various barriers to migration, and of the changes in these barriers, we have the present distribution of plants and animals, which is such as to enable us to divide the terrestrial surface of the globe into more or less well-marked regions. For animals the regions adopted by Wallace are nearly the same as those first suggested by Sclater as applicable to the distribution of birds;

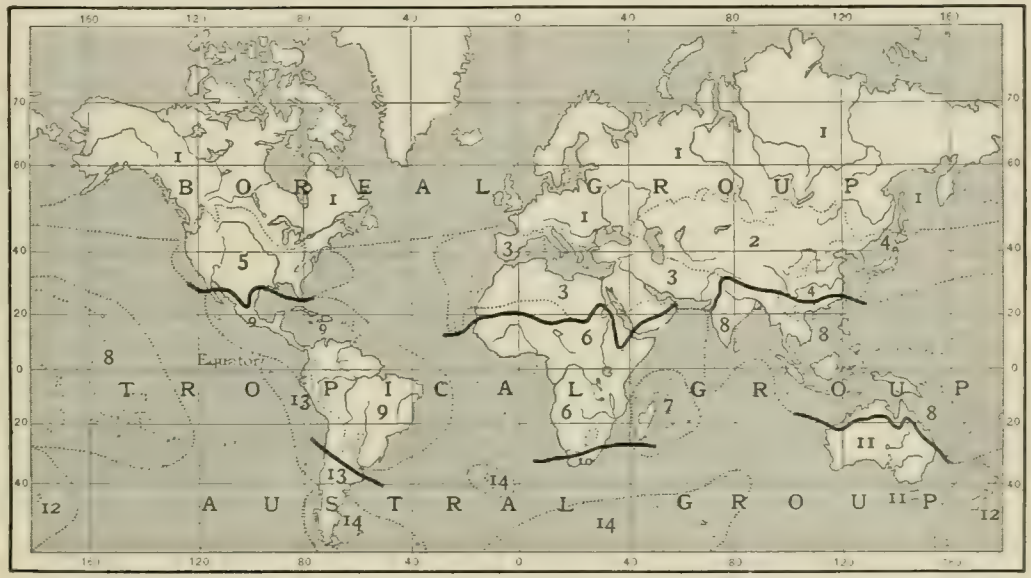
for, in spite of the exceptional facility which birds have for crossing barriers impassable by mammals, Wallace finds that the distribution of mammals (which afford the best means of marking off zoogeographical regions) corresponds with that of birds to an extent that one would not perhaps have previously anticipated. But with regard to these regions it must be remembered (1) that it is impossible in most cases to draw any very clearly marked boundary line between one region and another; (2) that the degree of divergence between different regions is different in different cases; and (3) that, when any two regions are compared, we have not the same degree of divergence between different groups of the animal kingdom, or between animals and plants belonging to the two regions. Obviously, the degree of correspondence depends largely on the facilities for dispersal, and largely also on the geological age of different groups; and both of these are varying factors. These considerations being premised, we may now state briefly the limits of the six zoological regions adopted by Wallace, as given in his *Island Life*. In the space to which the present article is necessarily restricted it is impossible to give even the most fragmentary sketch of the characteristic life of the different regions, for which the reader must be referred to the works cited at the end of the article.

(1) Palæarctic Region, including Europe and north temperate Asia and Africa to the northern borders of the Sahara.

(2) Ethiopian Region, consisting of all tropical and South Africa, together with Madagascar and the Mascarene Islands.

(3) Oriental Region, comprising all Asia south of the Palæarctic limits, and along with this the Malay Islands as far as the Philippines, Borneo, and Java.

(4) Australian Region, as already defined and characterised. Celebes might be referred almost with equal right to this or the previous region. New Zealand is



The Terrestrial Floral Domains according to Oscar Drude:

1. Northern.
2. Inner Asiatic.
3. Mediterranean.
4. Eastern Asiatic.
5. Central North American.
6. Tropical African.
7. East African Islands.
8. Indian.
9. Tropical American.
10. South African.
11. Australian.
12. New Zealand.
13. Andine.
14. Antarctic.

treated by Wallace as a highly peculiar sub-region of this great region.

(5) Nearctic Region, comprising all temperate and arctic North America, including Greenland, and extending on the south to an irregular line running from the Rio Grande del Norte on the east to a point nearly opposite Cape St Lucas on the west.

(6) Neotropical Region, the American continent south of this line, together with the West Indian Islands.

Heilprin (see below) and others advocate the union of the Nearctic and Palæarctic regions under the name of Holarctic, and introduce three transitional tracts (the Mediterranean, embracing southern Europe, northern Africa, and western Asia south of the Caspian and west of India, but exclusive of the southern half of Arabia; the Sonoran tract, embracing the north-west of Mexico; and the Austro-Malaysian tract, embracing Celebes and the smaller islands lying between it and New Guinea and Australia). Otherwise his major faunal divisions of the globe are similar to those of Wallace.

On plant distribution the most important recent works are those of Engler and Drude (cited at the end of the article). Engler attempts to trace the history of the vegetable kingdom since the Tertiary period, and comes to the conclusion that already in the Tertiary period four 'floral elements' (*Florenelemente*) could be distinguished—namely:

(1) The Arcto-tertiary element, characterised by an abundance of conifers and numerous genera of trees and shrubs now prevalent in North America, or in extra-tropical eastern Asia and in Europe.

(2) The Palæotropical element, characterised by the presence of the families and sub-families dominant in the tropics of the Old World; and still more by the absence of certain families, groups, and genera found in the territory of the Arcto-tertiary element.

(3) The Neotropical or South American element, which, according to Engler, must have had in Tertiary times much the same character as that now possessed by tropical Brazil and the West Indies.

(4) The old Oceanic element, consisting of forms which possessed the power of traversing considerable stretches of ocean and developing further on islands.

The modern provinces of the vegetable kingdom are subordinated by Engler to these great divisions. Drude, in the first place, distinguishes the oceanic

(marine) flora from the terrestrial forms, and the latter he divides into three great groups, and these again into fourteen floral domains (*Florenreiche*), the limits of which are shown on the accompanying map.

See P. L. Sclater's paper on the Geographical Distribution of Birds, in the *Jour. Linn. Soc.* (*Zool.*), vol. ii., and his Address to the Biological Section of the Brit. Assoc. at Bristol, 1875; A. R. Wallace's *Geographical Distribution of Animals* (2 vols. Lond. 1876), and his *Island Life* (Lond. 1880); A. Murray's *Geographical Distribution of Mammals* (Lond. 1866); Angelo Heilprin, *The Geographical and Geological Distribution of Animals* (New York and Lond. 1887); Bentham's Presidential Address to the Linnean Society, *Jour. Linn. Soc.*, x. (Botany, introd.); A. de Candolle's *Géographie Botanique* (2 vols. Paris, 1855); Sir J. Hooker's *Introduction to the Flora of Tasmania*, and *Handbook of the Flora of New Zealand*; also papers by him On Insular Floras, Brit. Assoc. 1866, and On the Distribution of Arctic Plants, *Trans. Linn. Soc.*, xxiii.; Asa Gray's Forest Geography and Archæology, in *Amer. Jour. of Science and Arts* (ser. iii. vol. xvi. 1875); Grisebach's *Vegetation der Erde* (Leip. 1872; 2d ed. 1884; French translation with valuable additional notes by Tchihatchef, 1875–78); F. Beddard, *Text-book of Zoogeography* (1895); Engler's *Entwicklungsgeschichte der Pflanzenwelt* (1879–82); Oscar Drude, *Die Florenreiche der Erde* (Erganzungsheft, No. 74, to *Petermann's Mittheilungen*, Gotha, 1884); and the chapters on Geographical Distribution in Darwin's *Origin of Species*, as well as chap. xxxviii. xiii. of Lyell's *Principles of Geology*.

Geography (Gr. *gē*, 'the earth'; *graphein*, 'to describe') etymologically means a description of the earth. The term as now accepted by its most competent students is applied to that department of science whose function it is to investigate the features of the earth's surface, and the distribution and mutual topographical relations of all which that surface sustains. It thus involves a study of the atmosphere or air-covering; the geosphere or land surface; and the hydrosphere or water-covering. The basis of geography is topography, including topographical relations and distribution. But to understand this thoroughly a certain elementary knowledge of various departments of science is necessary; and this knowledge is often included in what is somewhat vaguely known as Physiography (q.v.). To understand what may be regarded as the subject proper of geography—viz. the features of the earth's surface, their distribution and relations, and the distribution and relations of the denizens of the surface—some knowledge is required of the relations of the earth to the sun and the other members of the solar system, and of the celestial sphere generally. For exact topographical observation (see SURVEYING) a precise knowledge of certain astronomical data is required. This department is treated in the ordinary text-books under the heading of Astronomical or Mathematical Geography. An elementary acquaintance is also advisable with certain physical and chemical facts and laws, in order to understand the action of the atmosphere, of wind, rain, ice, and water (rivers, lakes, the ocean), and those other factors which help to constitute climate, and which do so much to shape those features with which geography has chiefly to deal. Equally useful is a general knowledge of the character of the great classes of rocks which compose the surface, and of the leading families of plants and animals which cover it, especially those of economical importance. This, though strictly preliminary, is often included along with a study of the features themselves, in Physical Geography. The investigation of the ocean and its denizens has recently been made a new department under the title of Oceanography or Thalassography. Again, to an account of the different states or communities into which man is divided the term Political Geography is commonly applied. Commercial Geography discusses the various countries and regions of the earth with special reference to their products and their requirements as affecting trade and commerce; and Medical Geography deals with localities as liable to become the seats of special diseases or groups of diseases.

Of course any section of geography may be treated and studied by itself, just as in the case of geology, or chemistry, or physics. But for purposes of research, for practical results, and even for educational uses, it is now considered more satisfactory to treat geography as one whole, dealing with the characteristics, distribution, and mutual relations of the great features of the earth's surface, the great classes of plants and animals which cover that surface, and of man himself. Such a study, it is maintained, is not only an excellent discipline, but the knowledge of facts and laws so obtained can be applied in many useful practical directions. Most of all it may be applied to the distribution of man in communities or states, and so, combined with other considerations, lead to a rational study of political geography and the course of history. In the same way the knowledge may be applied in the interests of industry, of commerce, of colonisation, and in many other economical directions. Geography, when thus treated, is, it is maintained, both more interesting and more profitable than when dealt with as a mere collection of unconnected facts and factors. It has long been so treated in Germany by such geographers as Ritter and Peschel, and their followers, and similar views are rapidly prevailing in England and America. In Germany the subject is often divided into general physical and political, and special physical and political geography, the latter, of course, dealing with particular countries or regions. Of course, like all other departments of learning, the subject may be broken up into sections, and dealt with for teaching purposes, and in a more or less elementary manner. For the most elementary stage, it is now generally considered advisable to begin with the immediate topographical surroundings of the pupil and proceed outwards. It should be stated that the eminent German geographer, Professor G. Gerland, maintains that geography has to do with the earth as a whole, and that the human side of it, or anthropogeography, belongs exclusively to history.

Special aspects of geography will be found treated under ANTHROPOLOGY, ASTRONOMY, CLIMATE, CLOUDS, EARTH, ETHNOLOGY, GEOGRAPHICAL DISTRIBUTION, GEOLOGY, GLOBE, HEAT, LAKES, LATITUDE AND LONGITUDE, MOUNTAINS, RAIN, RIVERS, SEA, WINDS, &c. As authorities to consult on the various aspects of geography referred to, may be mentioned Ritter's *Erdkunde*; Mrs Somerville's *Physical Geography* (latest edition); Peschel's *Physische Erdkunde*, *Abhandlungen zur Erd- und Völkerkunde*, and *Neue Probleme der Vergleichenden Erdkunde*; Suess, *Das Antlitz der Erde*; Ratzel, *Anthropogeographie*; *Unser Wissen von der Erde*: I. *Allgemeine Erdkunde*; Hinman's *Eclectic Physical Geography*; the volume of 'Education Reports' issued by the Royal Geographical Society, and the Lectures contained therein; General R. Strachey, *Lectures in Geography*; 'The Scope and Methods of Geography,' by H. J. Mackinder in *Proc. Roy. Geog. Soc.* (vol. ix.); 'Scientific Earth-knowledge as an Aid to Commerce,' by H. R. Mill in *Scot. Geog. Mag.* (vol. v. p. 302); 'Applied Geography,' by J. S. Keltie in *Contemp. Rev.* (Sept. 1888); Chisholm's *Handbook of Commercial Geography* (1889).

The facts of Political Geography will be found under the headings of the different continents, countries, and towns in this Encyclopædia. As authoritative works on the subject (both general and political) may be mentioned Reclus, *Géographie universelle* (with its English translation); and Stanford's *Compendium of Geography and Travel*.

For the purposes of geographical discovery, or the geographical knowledge of various parts of the earth, reference must be made to the articles on continents and oceans,

and also to the articles on CHARTS and MAPS. Here only general reference can be made to the progress of correct notions of the earth and, in connection therewith, of a general knowledge of the extent and form of the earth's surface. As the earliest efforts, within the historical period, to extend a knowledge of the earth's surface began with the Mediterranean nations of antiquity, it is natural and right to start there, although in one sense exploration is coeval with humanity.

The earliest definite idea formed of the earth by nations emerging from a primeval condition seems to have been that of a flat circular disc, surrounded on all sides by water, and covered by the heavens as with a canopy, in the centre of which their own land was supposed to be situated. The Phœnicians were the first people who communicated to other nations a knowledge of distant lands; and, although little is known as to the exact period and extent of their various discoveries, they had, before the age of Homer, navigated all parts of the Euxine, and penetrated beyond the limits of the Mediterranean into the Western Ocean; and they thus form the first link of the great chain of discovery which, 2500 years after their foundation of the cities of Tartessus and Utica, was carried by Columbus to the remote shores of America. Besides various settlements nearer home, these bold adventurers had founded colonies in Asia Minor about 1200 B.C.; a century later they laid the foundation of Gades, Utica, and several other cities, which was followed in the course of the 9th century by that of Carthage, from whence new streams of colonisation continued for several centuries to flow to parts of the world hitherto unknown. The Phœnicians, although less highly gifted than the Egyptians, rank next to them in regard to the influence which they exerted on the progress of human thought and civilisation. Their knowledge of mechanics, their early use of weights and measures, and, what was of still greater importance, their employment of an alphabetical form of writing facilitated and confirmed commercial intercourse among their own numerous colonies, and formed a bond of union which speedily embraced all the civilised nations of Semitic and Hellenic origin. So rapid was the advance of geographical knowledge between the age of the Homeric poems (which may be regarded as representing the ideas entertained at the commencement of the 9th century B.C.) and the time of Hesiod (800 B.C.) that, while in the former the earth is supposed to resemble a flat circular shield, surrounded by a rim of water spoken of as the parent of all other streams, and the names of Asia and Europe are applied only, the former to the upper valley of the Cayster, and the latter to Greece north of Peloponnesus, Hesiod mentions parts of Italy, Sicily, Gaul, and Spain, and is acquainted with the Scythians and with the Ethiopians of southern Africa. During the 7th century B.C. certain Phœnicians, under the patronage of Neku or Necho II., king of Egypt, undertook a voyage of discovery, and are reported to have circumnavigated Africa. This expedition is recorded by Herodotus, who relates that it entered the Southern Ocean by way of the Red Sea, and after three years' absence returned to Egypt by the Pillars of Hercules. The fact of an actual circumnavigation of the African continent has been doubted, but the most convincing proof of its probability is afforded by the observation which seemed incredible to Herodotus—viz. 'that the mariners who sailed round Libya (from east to west) had the sun on their right hand.' The 7th and 6th centuries B.C. were memorable for the great advance made in regard to the knowledge of the form and extent of the earth. Thales, and his pupil Anaximander, reputed to have been the first to draw maps, exploded many errors, and paved the way by their observations for the attainment of a sounder knowledge. The logographers contributed at this period to the same end by the descriptions which they gave of various parts of the earth; of these perhaps the most interesting to us is the narrative of the Carthaginian Himilco, who discovered the British Islands, including the Œstrymnides, which he described as being a four months' voyage from Tartessus.

With Herodotus of Halicarnassus (born 484 B.C.), who may be regarded as the father of geography as well as of history, a new era began in regard to geographical knowledge. Although his chief object was to record the struggles of the Greeks and Persians, he has so minutely described the countries which he visited in his extensive travels (which covered an area of more than 31° or 1700 miles from east to west, and 24° or 1660 miles from north to south) that his History gives us a complete representation of all that was known of the earth's surface in his age. This knowledge was extremely scanty. It was believed that the world was bounded to the south by the Red Sea or Indian Ocean, and to the west by the Atlantic, while its eastern boundaries, although admitted to be undefined, were conjectured to be nearly identical with the limits of the Persian empire, and its northern termination somewhere in the region of the amber-lands of the Baltic, which had been visited by Phœnician mariners, and with which the people of Massilia (the modern Marseilles) kept up constant intercourse by way of Gaul and Germany. In the next century the achievements of Alexander the Great tended materially to enlarge the bounds of human knowledge, for while he carried his arms to the banks of the Indus and Oxus, and extended his conquests to northern and eastern Asia, he at the same time promoted science, by sending expeditions to explore and survey the various provinces which he subdued, and to make collections of all that was curious in regard to the organic and inorganic products of the newly-visited districts; and hence the victories of the Macedonian conqueror formed a new era in physical inquiry generally, as well as in geographical discovery specially.

While Alexander was opening the East to the knowledge of western nations, Pytheas, an adventurous navigator of Massilia, conducted an expedition past Spain and Gaul, through the Channel, and round the east of England into the Northern Ocean. There, after six days' sailing, he, according to some, reached Thule (conjectured to be Iceland, although the actual locality is very uncertain), but according to the most competent interpreters of the story only heard of it. Returning, he passed into the Baltic, where he heard of the Teutones and Goths. Discovery was thus being extended both in the north and east into regions whose very existence had never been suspected, or which had hitherto been regarded as mere chaotic wastes. An important advance in geography was made by Eratosthenes (born 276 B.C.), who first used parallels of longitude and latitude, and constructed maps on mathematical principles. His work on geography is lost, yet we learn from Strabo that he considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis, and having one centre; although the belief in the spherical form of the earth was at the time confined to the learned few. He believed that only about one-eighth of the earth's surface was inhabited, while the extreme points of his habitable world were Thule in the north, China in the east, the Cinnamon Coast of Africa in the south, and the Prom. Sacrum (Cape St Vincent) in the west. During the interval between the ages of Eratosthenes and Strabo (born 66 B.C.) many voluminous works on geography were compiled, which have been either wholly lost to us,

or only very partially preserved in the records of later writers. Strabo's great work on geography, which is said to have been composed when he was eighty years of age, has been considered as a model of what such works should be in regard to the methods of treating the subject; but, while his descriptions of all the places he has himself visited are interesting and instructive, he seems unduly to have discarded the authority of preceding writers.

The wars and conquests of the Romans had a most important bearing upon geography, since the practical genius of the Roman people led them to the study of the material resources of every province and state brought under their sway; and the greatest service was done to geographical knowledge by the survey of the empire, which was begun by Julius Cæsar, and completed by Augustus. This work comprised a description and measurement of every province by the most celebrated geometricians of the day. Pliny (born 23 A.D.), who had travelled in Spain, Gaul, Germany, and Africa, has left us a compendium of the geographical and physical science of his age in the four books of his *Historia Naturalis* which he devotes to the subject. He collected with indefatigable industry the information contained in the works of Sallust, Cæsar, and others, to which he added the results of his own observations, without, however, discriminating between fact and fiction. The progress that had been made since Cæsar's time in geographical knowledge is evinced by Pliny's notice of arctic regions and of the Scandinavian lands, and the accounts which he gives of Mount Atlas, the course of the Niger, and of various settlements in different parts of Africa; while his knowledge of Asia is more correct than that of any of his predecessors, for he correctly affirms that Ceylon is an island, and not the commencement of a new continent, as had been generally supposed.

The study of geography in ancient times may be said to have terminated with C. Ptolemy, who flourished in the middle of the 2d century of our era. His work on Geography, in eight books, which continued to be regarded as the most perfect system of the science through the dark and middle ages down to the 16th century, gives a tolerably correct account of the well-known countries of the world, and of the Mediterranean, Euxine, and Caspian, together with the rivers which fall into those seas; but it added little to the knowledge of the north of Europe, or the extreme boundaries of Asia or Africa. Yet, from his time till the 14th century, when the records of the travels of the Venetian Marco Polo opened new fields of inquiry, the statements of Ptolemy were never questioned, and even during the 15th century it was only among a few German scholars at Nuremberg that the strange accounts given of distant eastern lands by the Venetian traveller were received as trustworthy where he differed from Ptolemy. Marco Polo had, however, unfortunately made no astronomical observations, nor had he even recorded the length of the day at any place, and hence the Nuremberg geographers, who had no certain data for estimating the extent of the countries which he had traversed, were the means of propagating errors which led to results that were destined to influence the history of mankind. For, taking Ptolemy's tables as their basis, they incorporated on their globes and maps the results of their own rough estimates of the length of Marco Polo's days' journeys, and they thus represented the continent of Asia as extending across the Pacific, and having its eastern shores somewhere in the region of the Antilles. These erroneous calculations misled Christopher Columbus to the false assumption that, by sailing 120 W., he would reach the wealthy trading marts of China, and the result of this conviction was his entering upon that memorable expedition which terminated in the discovery (in 1492) of the continent of America. Although there can be no doubt that the American continent was visited in the 9th and 10th centuries by Northmen, the event remained without influence on the history of discovery, and cannot therefore detract from the claims of Columbus. This momentous discovery, which had been preceded in 1486 by the exploration of the African coast as far as the Cape of Good Hope (which was doubled by Vasco da Gama in 1497), was followed by a rapid succession of discoveries. Within thirty years of the date of the first voyage of Columbus the whole coast of America from Greenland to Cape Horn had been explored, the Pacific Ocean had been navigated, and the world circumnavigated by Magellan (q.v.); the coasts of eastern Africa, Arabia, Persia, and India had been visited by the Portuguese, and numerous islands in the Indian Ocean discovered.

The 16th century was marked by continued attempts, successful and unsuccessful, to extend the sphere of oceanic discovery; and the desire to reach India by a shorter route than those of the Cape of Good Hope or Cape Horn led to many attempts to discover a north-west passage, which, though they signally failed in their object, had the effect of very materially enlarging our knowledge of the arctic regions. The expeditions of Willoughby and Frobisher in 1553 and 1576, of Davis (1585), Hudson (1607), and Baffin (1616), were the most important in their results towards this end. The 17th and 18th centuries gave a new turn to the study of geography, by bringing other sciences to bear upon it, which, in their turn, derived elucidation from the extension of geographical knowledge; and it is to the aid derived from history, astronomy, and the physical and natural sciences that we owe the completeness which has characterised modern works on geography. In the 17th century the Dutch, under Tasman and Van Diemen, made the Australasian islands known to the civilised world; and in the latter half of the 18th century Captain Cook (q.v.) extended the great oceanic explorations by the discovery of New Zealand and many of the Polynesian groups, and by proving the non-existence of a 'great Antarctic continent,' stretching far north in the Pacific. The antarctic lands were first visited in 1840 by American, English, and French expeditions, under their respective commanders, Wilkes, Ross, and Dumont d'Urville. Polar exploration, after having been for a time in abeyance, has within late years been vigorously prosecuted by the United States and various European countries; and in 1879–80 Baron Nordenskjöld succeeded for the first time in history in navigating the north-east passage round Europe and Asia. In America the travels of Humboldt, Lewis and Clark, Frémont, and others, and the work of the United States and Canadian Surveys, of the Argentine government explorers, and of railway pioneers, have done much to make us acquainted with broad general features, but much remains to be done in regard to special districts of central and southern America. In Asia numerous travellers, geographers, and naturalists, combined with the expeditions of Russian armies, and explorers like the late General Prejevalsky, have contributed to render our knowledge precise and certain in respect to a great part of the continent, whose natural characteristics have been more especially represented by the great physicist Ritter; while we owe a large debt of gratitude to the Jesuit missionaries, whose indefatigable zeal has furnished us with a rich mass of information in regard to minor details of Asiatic life and nature, nor must the work of the Indian

Survey and its European and native explorers be forgotten. In Africa much light has been thrown on the character and condition of the African continent by many of its greatest explorers—as Bruce, Park, Clapperton, the Landers, Burton, Speke, Barth, Vogel, Livingstone, Cameron, Stanley, Thomson, Schweinfurth, Nachtigal, Junker, and Emin Pasha; General Gordon and his subordinate officers; the French in Senegambia and on the Upper Niger; Wissmann and Pogge, and other officers of the Congo Free State; German explorers in east and central Africa, and the missionaries of various denominations. In Australia, although much still remains to be done, the obscurity which hung over the interior has been to a great extent diminished by the explorations of Sturt, Eyre, Leichhardt, and the brothers Gregory; and still more by the highly important labours of Burke and Wills, who in 1860 crossed the Australian continent from Melbourne to Carpentaria. The establishment in 1872 of a telegraph line from Adelaide to Port Darwin right across the continent, and the maintenance of stations along the line, formed an admirable base for further exploration. Giles, Warburton, and Forrest forced their way in nearly parallel lines to the west coast. The labours of these and other explorers indicate that much of the continent of Australia, though often covered with dense growth of spinifex, acacia, and eucalyptus, is not available for colonisation by Europeans.

The government surveys of the various European countries, of the British possessions, and of other civilised states have not only added to a detailed knowledge of the face of the earth, but given us more precise ideas of its shape. Again, various deep-sea exploring expeditions of recent years, the chief among which was that sent out by the English government in the *Challenger* (q.v.), have added greatly to our knowledge of the geography of the oceans.

The progress of recent discovery has been aided by the encouragement given to exploration by the governments of different countries, and by the efforts of the numerous geographical societies, of which there are now over one hundred; while the constantly increasing mass of information collected by scientific explorers is rapidly diffusing correct information in regard to distant regions.

On the subject of geographical discovery, the following works may be consulted with advantage: Bunbury's *History of Ancient Geography* (1880); Vivien de Sainte-Martin's *Histoire de Géographie*; Kiepert's *Manual of Ancient Geography* (1881); *Précis de Géographie Universelle*, by Malte Brun; Humboldt's *Hist. crit. de l'Hist. de la Géographie*, and the *Cosmos*; Ritter's *Asien*; Kloeden's *Erdkunde*; Reclus, *Nouvelle Géographie Universelle*. Stanford's *Compendium of Geography and Travel*, based on Hellwald; H. F. Tozer, *A History of Ancient Geography* (1897); C. R. Beazley, *The Dawn of Modern Geography* (1897). And see Petermann's *Mittheilungen*, the *Proc. Roy. Geog. Soc.*, and the *Geographisches Jaurbuch*.

Geology (Gr. *gē*, 'the earth;' *logos*, 'a discourse') is the science of the earth—that science, namely, which has for its object the study of the various constituents of the earth's crust, with a view to discover how those materials have been aggregated and caused to assume the appearances which they now present. Geology, in short, is an inquiry into the history and development of the earth's crust, and of the several floras and faunas which have successively clothed and peopled its surface. As a science geology is comparatively young, although it can hardly be doubted that from a very early period the phenomena with which it deals must have claimed some attention. It is easy, indeed, to trace in old mythologies and legends the influence of the geological features of the land upon the human imagination. Volcanic eruptions, earthquakes, avalanches, and landslips, the havoc of torrential waters, and the destructive action of waves and breakers have unquestionably left their impress upon the superstitions and beliefs of all primitive peoples. One may believe that many of the remarkable scientific premonitions which are met with in oriental cosmogonies and the early writings of the Greeks may have been suggested by geological phenomena. The occurrence of sea-shells in the rocks of mountains and regions far removed from the sea may well have given rise to the oriental belief in the alternate destruction and renovation of the world. Pythagoras and Strabo both recognised that changes had taken place on the surface of the earth, but neither appears to have got beyond the observation of a few obvious phenomena—their explanations of which are hardly entitled to be considered more than vague guesses. It is not until we reach the close of the 15th century that we find geological phenomena attracting the attention of competent observers. With the investigations of the celebrated painter, Leonardo da Vinci, together with those of Fracastoro, a new departure was taken. The numerous fossil shells discovered in engineering operations were appealed to by them as evidence of former geographical changes—their method of reasoning being consistent and logical. Unfortunately it did not convince either their contemporaries or immediate successors—some of whom held the extraordinary view that shells and other fossil organic remains were not really what they appeared to be, but the result of a plastic force which had somehow fashioned them in the bowels of the earth. Fossils were further supposed to be the results of the fermentation of fatty matter, or of terrestrial exhalations, or of the influence of the heavenly bodies, or, finally, to be simply earthy concretions or sports of nature. Others, however, while maintaining that fossils were in truth the relics of formerly living creatures, held the opinion that all these had been buried at the time of the Noachian deluge. This controversy lasted for more than a hundred years, but long after the true character of fossils had become generally admitted their entombment in the strata continued to be attributed to the action of the deluge. This belief prevailed through the 17th and 18th centuries, and sadly interfered with the growth of geology; the prolonged infancy of which must be largely attributed to its influence. Steno, a Dane, who lived in Italy in the middle of the 17th century, would appear to have been the first to observe a succession in the strata. Hitherto stratified rocks had not been differentiated; they were all lumped together as representing the tumultuous deposits of the Noachian deluge. Steno, however, distinguished between marine and fresh-water formations, and showed that there were rocks older than the fossiliferous strata in which no organic remains occurred. Nevertheless, this clear-sighted observer could not free himself from the fashionable hypotheses of his day. While a belief in the universality of the Noachian deluge was prevalent, many strange 'theories of the earth,' such as that by Bishop Burnet, saw the light. These showed not only how the world had been evolved out of chaos, how it fared before, during, and after the deluge, but in what precise manner it was eventually to be wound up and consumed. The 'theories' referred to differed in detail, but their imaginative authors agreed in the notion of an interior abyss, whence at the time of the Noachian catastrophe the waters rushed, breaking up and bursting through the crust of the earth to cover its surface, and whither, after the deluge, they returned again.

Leibnitz (1680) proposed the bold theory that the earth was originally in a molten state, and that

the primary rocks were formed by the cooling of the surface, which also produced the primeval ocean by condensing the surrounding vapours. The sedimentary strata resulted from the subsiding of the waters which had been put in motion by the collapse of the crust on the contracting nucleus. The process was several times repeated until at last equilibrium was established.

Hooke (1688) and Ray (1690) considered the essential condition of the globe to be one of change, and that the forces now in action would, if allowed sufficient time, produce changes as great as those of geological date. In Italy, Vallisneri (1720), Lazzaro Moro (1740), and his illustrator, Cirillo Generelli, taught that there had been depressions of the land, during which marine fossiliferous strata were deposited, and that subsequently the sea-bottom had been elevated by the subterranean forces, and converted into dry land. Moro maintained the impossibility of the whole earth having been covered by the waters of the sea up to the tops of the highest mountains. The continents, he said, had been upheaved, and the fractures and dislocations of the strata were pointed to in confirmation of this view. Generelli insisted upon the gradual degradation of the land by running water, and held that the waste was so great that eventually the mountains must be washed down to the sea. This inevitable degradation of the surface, however, would be counterbalanced, he inferred, by elevation of the land elsewhere. But as Italian geologists, in common with those of other countries, believed that the world was only some 6000 years old, Moro and Generelli found some difficulty in explaining how so many thousands of feet of strata could have been accumulated within the limited period allowed by the orthodox chronology. They suggested, therefore, that the materials entering into the formation of the strata had been largely derived from volcanic eruptions.

Eventually the more advanced views held in Italy spread into France, Germany, and England. Buffon (1749), by the publication of his *Theory of the Earth*, evoked a spirit of inquiry in France; Lehmann (1756), Fuchsel (1762), and others in Germany did much to establish more correct methods of observation and interpretation of geological phenomena than had hitherto prevailed; while in England a distinct advance was made by Michell (1760) in his essay on the Cause and Phenomena of Earthquakes. The next name that comes into prominence is that of Werner, professor of Mineralogy at Freiburg in Saxony (1775). This celebrated writer framed a classification or system of the rocks of the Harz Mountains, in the order of their succession, and consequently in that of their formation, and maintained that this order would be found to prevail generally throughout the world. Werner's classification has proved inadequate, and even in many respects erroneous. Nevertheless, to him belongs the great merit of having brought into prominence a definite principle in the construction of the earth's crust, and a precise method of geological investigation. This discovery of the fact that strata occur in a certain order of superposition had been anticipated by several Italian geologists, and by Lehmann in Germany, but Werner's fame as a brilliant investigator and attractive teacher overshadowed and eclipsed the most of his predecessors. In some respects the views of this eminent man were retrograde. He maintained, for example, that his 'formations' were universal, and had been precipitated over the whole earth in succession, from a common menstruum or chaotic fluid. The igneous rocks, according to him, were chemical precipitates from water; he believed that no volcanoes existed in the earlier ages of the world, but that volcanic action was exclusively of modern date. Yet the true nature of igneous rocks had already been recognised in Italy, France, England, and Germany. With the publication of Werner's views on this subject a great controversy began, which was carried on with an acrimony that is now hard to realise. Those who upheld the igneous origin of such rocks as basalt were styled Vulcanists, while those who followed Werner became known as Neptunists. The great apostle of Vulcanism in Britain was James Hutton (1788). He not only insisted upon the igneous nature of basalt rocks but demonstrated in the field that granite likewise was of igneous origin. This philosophical thinker deprecated the calling-in of hypothetical causes to explain geological phenomena. The only agents of change, according to him, were those which are now at work in modifying the earth's crust. The past, therefore, was to be interpreted through the present. It was only through our knowledge of the methods employed by nature in carrying on her operations in our own day that we could hope to interpret the record of the rocks. The Huttonian theory was fortunate in having for its expounder John Playfair, whose famous *Illustrations* (1802) has long been held in the highest esteem, and is still studied by geologists. Another friend and disciple of Hutton, Sir J. Hall, became the founder of experimental geology, and did much towards the establishment of the cardinal doctrines of his teacher. Hutton's observations were confined to Scotland, in which fossiliferous strata are not prominently developed. It was the igneous masses —the crumpled and shattered rocks of mountain and glen and sea-coast, and the never-absent evidence of denudation and decay that fascinated him. He saw 'the ruins of an older world in the present structure of the globe,' but he knew nothing of that long succession of ruined worlds, each characterised by its own life-forms, with which William Smith (1790) was shortly to astonish geologists. This able investigator alone and unaided had explored all England on foot, and succeeded in completing a geological map of the country on which the strata were for the first time delineated and thrown into natural divisions. His views as to the law of superposition among strata were arrived at independently of Werner, and he was the first to point out how each rock-group was distinguished by its own peculiar fossils. Hence Smith is justly entitled to be called the founder of historical or stratigraphical geology. Since then the progress of geology has been rapid. Fossils which at first were valued chiefly as marks by which one formation could be distinguished from another by-and-by claimed fuller attention—the classic researches of Cuvier in the Paris basin forming a great epoch in Palæontology (q.v.), or the study of fossil organic remains.

In closing these remarks on the history of the geological sciences, it would be unjust to omit the name of Lyell, whose great *Principles of Geology* (1830-33) did invaluable service. His labours were based on those of Hutton and Playfair, but he carried out their doctrines further in some directions than either of these geologists were prepared to go, while in other directions he did not advance so far. Before the appearance of Lyell's well-known work, the Huttonian philosophy had conspicuously triumphed, but geologists were still prone to account for what appeared to be 'breaks in the succession' by the hypothesis of vast catastrophes. They conceived the possibility of world-wide destruction of floras and faunas, and the sudden introduction or creation of new forms of life, after the forces of nature had sunk into repose. The full meaning of denudation had not as yet been generally appreciated, and subterranean

action was still frequently appealed to in explanation of orographic features which are now recognised to be the work of epigene action. Such views gained for their upholders the name of Cataclysmists or Catastrophists. Lyell's main idea that the present is the type of all preceding ages, so far as these are revealed by the fossiliferous strata, has gained for his school the title of Uniformitarian. But within recent years many of his disciples have departed somewhat from the teaching of their master, and maintain that the operations of nature have been the same *in kind*, but not necessarily *in degree*. The impulse given to the advance of biological science by the publication of the *Origin of Species* (1859) has also affected geology, and not on its palæontological side alone. In the departments of physical and stratigraphical geology one may note a larger and broader method of treatment since the appearance of Darwin's famous work—the dominant tone in geological literature at present being rather evolutional than uniformitarian in the narrow sense. Another distinguishing feature of geological science in our day is the great attention paid to Petrography (q.v.), the study of which had fallen into comparative neglect in this country for many years. Interest in it, however, was revived by Dr Sorby, who showed how much might be learned by examining thin slices of rocks and minerals under the microscope. The introduction of the microscope into petrographical investigation has thus opened up a wide and novel field of inquiry, from the assiduous cultivation of which much may be expected.

It may be interesting to point out as shortly as possible the order of development of the geological sciences. Unquestionably the earliest to take shape was *Mineralogy*—a work on descriptive mineralogy by Agricola having appeared in 1546. In fact, several complete treatises had been published before the middle of the 18th century. *Geognosy*, or the study of the various rocks of which the earth's crust is composed without special reference to the mode of their arrangement, was the kind of geology which chiefly occupied the attention of the earliest investigators. The term is now practically disused, and in its place we have *Petrography*. When employed by modern writers it has usually a wider signification (see GEOGNOSY). *Structural Geology*, or the mode in which rocks are built up in the earth's crust, next began to come into prominence, and *Dynamical Geology*, or the study of causes now in action soon followed—the system advocated by Hutton and Playfair being that which has gained general acceptance. Thereafter followed *Experimental Geology*, of which Hall was the father. Although some progress had been made by Lehmann, Fuchsel, and Werner in the method of determining the succession of strata and of grouping these in chronological order, yet *Historical* or *Stratigraphical Geology* can hardly be said to have existed as a science before the date of William Smith's classical researches. *Palæontology* is of still more recent origin, the names of Cuvier, Lamarck, and Brongniart being conspicuous among its earliest exponents.

A brief outline may now be given of the various departments of geology, properly so called.

DYNAMICAL GEOLOGY.—The modern system of geology is based on the principle that the past is to be interpreted through the present. In other words, the geologist believes in the constancy of nature, and that by studying the effects produced by the action of her various agents in the present he will be able to interpret the records of such action in the past. The study of such natural operations constitutes *dynamical geology*.

The various forms of energy from which geological changes arise may be divided into two series—viz. *hypogene action* and *epigene action*.

Hypogene Action.—Under this head come the changes which are induced by the internal heat of the earth, those changes, namely, that are in progress beneath the earth's surface. In this category are included volcanoes and volcanic action, volcanic products, and the chemical and mechanical changes which are superinduced in such products and upon the rock-masses with which these come into contact during volcanic eruptions (see VOLCANOES). Lava (q.v.) and Tuff (q.v.) are studied as regards their composition, texture, and structure, while the manner in which these and other volcanic products are built up is likewise investigated. All this is done with a view to comparing such volcanic products with similar crystalline and fragmental rocks which occur in regions where volcanic action may have become quite extinct. Another most important set of hypogene phenomena are movements of the earth's crust. See EARTHQUAKES, UPHEAVAL, BEACHES (RAISED), SUBMARINE FORESTS.

Epigene action has reference to those operations that affect mainly the superficial portion of the earth's surface. The epigene agents are the atmosphere, rain, brooks and rivers, ice, the sea, and life. The effects of atmospheric action are seen in the general disintegration of rocks, the formation of Soil (q.v.), and the accumulation of dust and sand (see DRIFT). In the diffusion of life over the globe, wind has also no doubt played in all ages an important part. Rain, again, charged with the carbonic acid, &c., which it absorbs from the atmosphere and vegetable soil, acts chemically upon rocks—all of which are more or less permeable. Much rock-disintegration is thus induced, the 'weathered' materials being dispersed or accumulated locally by the mechanical action of the rain. The chemical action of rain is not confined to the surface of the ground, for much water filters down through natural cracks, fissures, &c., and is thus enabled to soak into the rocks at all depths. The underground water which is not absorbed in the interstitial pores of rocks rises eventually, and is discharged at the surface as Springs (q.v.), which are more or less impregnated with dissolved mineral matter abstracted from below. These springs are either cold or thermal, and constant or intermittent. In some volcanic regions the water comes to the surface in eruptive fountains (see GEYSER). The destructive action of such underground waters is seen in the excavation of caves, tunnels, and other subterranean passages (see CAVE), and in the production of Landslips (q.v.) and rock-falls; while their reproductive action is familiarly illustrated by the formation of Stalactites and Stalagmites (q.v.), and the accumulation of great masses and sheets of siliceous Sinter and Calcareous Tufa (q.v.). Brooks and rivers act as potent agents of change. By means of the detritus which they sweep along or carry in suspension, they rub, grind, and erode the rocks over which they flow, and thus in time ravines and valleys have been excavated. The eroded materials are constantly travelling from higher to lower levels until they come to rest in lakes or the sea. Hence lakes and the sea in many places are being gradually silted up—the growth of Deltas (q.v.) being one of the most notable evidences of epigene action. The action of rain and running water is greatly aided by frost, which is a powerful disintegrator of rocks. Water freezes as well in the minute pores of rocks as in the fissures by which rocks are traversed, and thus when thaw ensues the loosened grains and particles are ready to be carried away by wind, rain, and melting snow; while disjointed blocks, &c. may fall asunder and topple from cliffs or roll down steep slopes. In regions of

perennial snow-fields the avalanche and the glacier likewise act as important denuders of the surface, and transporters of rock-debris from higher to lower levels (see AVALANCHES, GLACIERS, BOULDER-CLAY, &c.). Again, in certain latitudes lake and river ice are conspicuous agents of change—acting especially as rafts for the transport of stones and debris (see ANCHOR-ICE). Thus the whole surface of the land from the highest mountains down to the sea is being gradually degraded or lowered by the combined action of many epigene agents. There is a continual and universal disintegration of rocks going on, and a no less continual transport of material and building up of this into new formations. Alluvial flats and terraces, deltas, &c. may be cited as prominent examples of the sedimentary series of modern accumulations, while the chemical series is well represented by the calcareous formations of springs and brooks, and the precipitations of common salt, sulphate of lime, &c., which are taking place in saline lakes (see LAKES).

The sea as a geological agent acts in three ways: it erodes rocks, and transports and accumulates sediment. The work of erosion is confined for the most part to that marginal belt within which waves and breakers work. These by means of the shore-detritus batter and undermine cliffs, and cause them gradually to recede, and hence the sea may be said to act like a great horizontal saw. The materials brought down by rivers or detached from the shore by the action of the sea itself are distributed by currents over the sea-floor, the coarser detritus gathering in shallow water, while the finer sediment is swept out to greater depths and spread over wider areas. Such terrigenous materials extend outwards from the shore to a distance of 60 to 300 miles, and to depths of 2000 feet or more. They are confined, therefore, to a comparatively narrow belt of the sea-bottom. Over the abysmal depths of the sea, the only accumulations in progress are organic ooze and a peculiar red clay which is believed to be the result of the chemical action of sea-water on products of volcanic origin (see ABYSMAL ACCUMULATIONS). Now and again, stones and debris may be carried out to sea by icebergs and dropped beyond the zone of terrigenous sedimentation. Similarly, rock-fragments entangled in the roots of trees or buoyed up by seaweeds may now and again come to rest in abysmal regions. Reference has been made to the geological action of the ice of lakes and rivers, but the icebergs and ice-rafts of high latitudes must not be omitted. Much rock-debris is distributed by such agencies over the sea-bottom, detached fragments of the 'ice-foot' (see ICE, vol. vi., p. 59) being the most notable carriers of stones.

The action of plants and animals is not ignored by geologists. Plants aid in the disintegration and rupture of rocks by means of their roots and the organic acids derived from them during decay. Rocks are drilled and bored by some kinds of marine molluscs, annelids, echini, and sponges, and are thus weakened and more readily yield to the action of waves and breakers. Burrowing animals also bring about changes, the common earthworm being an efficacious agent in the formation of soil (see EARTHWORM). Plants occasionally act as conservative agents, as in the fixing of blown sands (see DUNES), and in protecting the banks of lakes and rivers. Again, forests, by equalising and regulating the flow of the water of precipitation, prevent the destruction of soils and subsoils by torrential action. In some regions also the rocks along a seashore are partially protected from the waves by seaweed, sponges, zoophytes, and gregarious molluscs. Amongst formations of organic origin may be mentioned soil (in part), peat-bogs, morasses, mangrove-swamps, bog-iron ore, &c. Some calcareous algæ also form considerable beds, as among the reefs of the Florida seas; while certain marsh-loving and fresh-water plants have the power of abstracting carbonate of lime from water and encrusting themselves therewith. Thick masses of calc-tufa have originated in this way. The organic oozes of the deep seas are good examples of deposits formed of the exuviæ of minute pelagic organisms; and the great coral-reefs (see CORAL) of the warmer oceans are still further evidence of the importance of life in the production of new formations. Such are some of the accumulations which are almost wholly composed of organic debris; but animals and plants contribute to the growth of many other deposits. The marine terrigenous formations are charged more or less abundantly with the relics of animal and plant life; nor are similar remains wanting in the alluvial deposits of rivers and lakes.

PETROLOGY.—From the study of causes now in action the geologist learns that many of the rocks, with which every one, whether observant or not, necessarily makes some acquaintance, are of the same character as epigene and hypogene products. For a particular account of the rocks themselves, PETROGRAPHY and the articles therein cited may be consulted; here all that can be attempted is to point out very briefly how far a knowledge of formations now in progress enables us to explain the nature and origin of rocks.

(1) *Igneous Rocks.*—In Great Britain and other countries where at present there is no volcanic action we meet with various glassy rocks, such as pitchstone and obsidian, with semi-crystalline rocks, as trachyte, phonolite, liparite, andesite, basalt, &c., with crystalline rocks, such as certain dolerites, and with fragmental rocks, like tuff and agglomerate, which in every essential particular resemble the products of modern volcanoes. But, as might have been expected, the older igneous rocks are often more or less altered, such alteration having been superinduced by the chemical action of percolating waters, by pressure, by crushing, or by these and other causes combined. There is a class of crystalline rocks, however, which, although they consist of the same mineral ingredients as occur in many igneous rocks, yet differ so materially in character from lavas that geologists are warranted in believing that they could not have been consolidated at or near the surface of the earth. This class is represented by such rocks as granite, syenite, gabbro, and certain diorites, dolerites, quartz-porphyries, &c. A study of these rocks under the microscope and in the field as rock-masses leads to the belief that they are indeed of igneous origin, but have cooled and consolidated at some depth in the earth's crust, their appearance at the surface being due to subsequent denudation. Thus two classes of igneous rocks are recognised—viz. *volcanic* or superficial, and *plutonic* or deep-seated.

(2) *Derivative Rocks.*—Under this head are included all the products of epigene action. They are termed *derivative* inasmuch as most of them are composed of materials which have been derived from pre-existing rocks by the chemical or mechanical action of epigene agents, while others are made up of organic debris. They may be roughly classified as follows:

Mechanically-formed Rocks.—These consist of fragmental materials. They are granular non-crystalline aggregates, the constituent ingredients of which may be angular or rounded in form, and may or may not be arranged in layers. They consist of (*a*) *Eolian* or *Aerial* rocks, such as blown sand (dunes) and dust-deposits. The products of the 'weathering' action of the atmosphere, such as rock-debris (breccia), certain clays, &c., are also in part of eolian origin. (*b*) *Sedimentary* rocks,

as conglomerate, breccia (in part), sandstone, graywacke, various clays, mudstones, shales, &c. (*c*) *Glacial* rocks, as rock-debris, erratics, moraines, boulder-clay, &c.

Chemically-formed Rocks.—The rocks included under this subdivision are sometimes earthy in character, but more frequently show a crystalline or compact sub-crystalline texture. Among the more typical kinds are kaolin and various other clays, stalactites and stalagmites, calc-tufa and its varieties, geyserite (siliceous sinter), rock-salt, dolomite, gypsum, flint, chert, various ironstones, &c.

Organically-derived rocks are made up of the relics of animal and plant life. They include a great variety of limestones, diatom-earth (tripoli), flint (in part), various phosphatic deposits, peat, lignite, coal, anthracite, oil-shale, various iron ores, &c.

No hard and fast line can be drawn between the older and younger products of epigene action. It is obvious that conglomerate and sandstone are merely compacted gravel and sand; breccia is only consolidated rock-debris; while lignite and coal are simply vegetable matter more or less mineralised. The thick fossiliferous limestones of the earth's crust are paralleled by the coral-reefs and organic oozes of existing oceans, and have evidently had a similar origin. Every derivative rock, indeed, can be compared with a like product of modern epigene action. The older products, it is true, are most frequently solidified, while the younger are oftener more or less incoherent and unconsolidated. But this difference is not essential, and is only what might have been expected. The older products have for a long time been exposed to the action of percolating water. In many cases they have been subjected to the influence of subterranean heat and enormous pressure, and we need not wonder, therefore, that they should have acquired a more or less indurated character. But solidification does not invariably characterise the older products, nor are modern accumulations always incoherent. There are indurated conglomerates and sandstones of very recent formation, and some modern coral-rock is as hard and compact as the older limestones. Hence the term *rock* is applied to all the products of epigene and hypogene action alike, whether the material so designated be yielding, as clay and peat and blowing sand, or hard and resisting, as conglomerate, limestone, or granite.

(3) *Metamorphic Rocks.*—All rocks sooner or later undergo some process of alteration whereby their original character becomes modified. Thus, by the chemical action of percolating water some limestones have been more or less changed into dolomite; olivine rocks have been altered into serpentine; some sandstones have been converted into quartzites. Derivative rocks at the point of contact with igneous rocks are very frequently altered to a greater or less extent. Thus, ordinary limestone becomes crystalline marble, coal is changed into graphite, sandstone into quartzite, clay and shale into porcellanite. When alteration of a rock, however caused, has proceeded so far as to produce a rearrangement of the constituent elements of a rock, and to develop a crystalline or semicrystalline structure, such extreme alteration is termed *metamorphism*, and the rocks so affected are described as *metamorphic*. Rocks of this kind are sometimes confusedly crystalline or massive in structure, and in hand specimens might be mistaken for plutonic igneous rocks; but by far the larger number are distinguished by a peculiar flaky or pseudo-laminated structure which is termed *Foliation* (q.v.). In foliated or schistose rocks the constituent minerals are arranged in alternate lenticular layers which merge into each other. Such arrangement, it must be understood, has no relation to the layers of deposition so frequently present in derivative rocks like shale, sandstone, &c. The foliated structure has been superinduced in rocks, some of which may have been igneous and others aqueous in origin. It is obvious, however, that the study of causes now in action can throw little light on the origin of foliation. We may study the changes induced in rocks by contact with the products of modern volcanic action, and these will doubtless enable us to understand how certain alterations in rocks have been brought about; but schistosity is not superinduced in rocks in the neighbourhood of modern volcanic orifices. In Britain and other countries, however, denudation has exposed the interior and basal portions of ancient volcanoes, and we can now study in detail the fractured and baked rocks through which heated gases, molten matter, &c. have been erupted. Nay, in some cases, we can even examine enormous masses of plutonic crystalline rock which are believed to be the reservoirs from which the molten matter of our ancient volcanoes was pumped to the surface. Such great plutonic masses are frequently surrounded by a zone or belt of crystalline schistose rocks, such as gneiss, mica-schist, &c. The rocks are most crystalline and schistose in the immediate proximity of the igneous mass, but gradually lose these characters as they recede from its neighbourhood, until by-and-by they pass into ordinary derivative rocks such as graywacke, shale, &c. Some schistose rocks, therefore, undoubtedly owe their origin to contact with deep-seated igneous masses. Again, it has been observed that where rocks, whether igneous or derivative, have been subjected to enormous crushing and pressure, they not infrequently become crystalline and schistose. There are some schistose rocks, however, the origin of which is still very obscure. Geologists cannot yet assert, therefore, that all schistose rocks are metamorphic (see ARCHÆAN SYSTEM). Among the most characteristic metamorphic rocks are quartzite, marble, phillite, mica-schist, talc-schist, chlorite-schist, hornblende-schist, actinolite-schist, gneiss, granulite, eclogite, &c.

STRUCTURAL or GEOTECTONIC GEOLOGY is that branch of the science that deals with the arrangement or structure of rock-masses.

Structure of Igneous Rocks.—Igneous rocks are grouped under two series—viz. (*a*) *Contemporaneous* and (*b*) *Intrusive* eruptive rocks.

(*a*) *Contemporaneous eruptive rocks* are either crystalline or fragmental. The crystalline rocks are simply old lava-flows, while the fragmental rocks consist of tuff and its varieties. They are in short the products of volcanic action, and have been erupted at the earth's surface, accumulating either upon the land or under water. Many of these rocks have apparently been erupted from vents of the ordinary modern type, but others appear to have come up along lines of fissure in the earth's crust—the lavas overflowing the surface in broad floods. Successive outflows of this kind, accompanied frequently by the ejection of fragmental materials, have built up some great plateaus. Contemporaneous lavas are generally more or less scoriaceous or porous above and below.

(*b*) *Intrusive eruptive rocks* are also crystalline and fragmental. *Necks* are approximately cylindrical funnels filled with either crystalline igneous rock or fragmental materials, or with both. They are obviously the plugged throats of old volcanoes, the upper parts of which have been removed by denudation. *Intrusive Sheets* are more or less lenticular masses of crystalline igneous rock which have been erupted amongst strata in a direction more or less closely conformable with the planes of bedding. They seldom show any scoriaceous structure, and

generally bake and alter overlying as well as underlying rocks, thus clearly indicating their subsequent origin. *Dykes* (q.v.) consist generally of crystalline rock which has been erupted in approximately vertical and even-sided fissures, thus giving rise to wall-like intrusions. Occasionally fragmental igneous rocks, such as agglomerate, are met with in similar positions. *Veins* is the term applied to smaller irregular and more or less tortuous intrusions of crystalline rock. *Bosses* (see NECK) are amorphous masses of crystalline rock, rising more or less vertically through surrounding rock-masses. There is reason to believe that many of these 'bosses' are the deep-seated reservoirs from which volcanoes were supplied with lava. 'Dykes,' 'veins,' and sometimes 'sheets' proceed from them into the adjacent rocks, which are often much altered and metamorphosed.

Structure of Derivative Rocks.—The most characteristic feature of these rocks is their bedding or stratification—a structure which is due to the mode of their accumulation. Hence they are often spoken of as the 'stratified rocks.' But, as we have seen, stratification likewise characterises contemporaneous eruptive rocks. As far the larger number of derivative rocks are simply aqueous mechanical and chemical sediments, they are also often termed 'aqueous' and 'sedimentary rocks.' Individual beds in a group of strata are lenticular or wedge-shaped; so that when any particular stratum is followed in one direction it eventually thins away and dies out. And the same is the case with groups of strata. Fine-grained deposits such as shale and limestone tend to be more persistent and to cover wider areas than sandstones and conglomerates. Almost any diversity of strata may occur in a group or series, but it is more usual to find certain kinds of rock associated together; thus, fine sandstone alternates with shale, conglomerate with grit, limestone with fine shales, &c. Again, individual beds are often found to change their character as they are followed in certain directions. Conglomerate, for example, passes laterally into sandstone, sandstone becomes argillaceous and passes into shale, while shale, by the gradual increase of calcareous matter, becomes marly and often passes into limestone. Sometimes the stratification is extremely regular, at other times the beds thicken and thin out very irregularly, and not infrequently they show what is called *false-bedding* or *current-bedding*—a structure which is seen both in aqueous and eolian accumulations (see DUNES). Amongst the surface-markings seen in sedimentary rocks the most common are ripple-marks, sun-cracks, rain-prints, and tracks, trails, burrows, &c. of worms, crustaceans, molluscs, reptiles, birds, &c.

Strata are not often quite horizontal; they usually *dip* at a less or greater angle, and such inclined strata are as a rule the remaining portions of large curves or undulations, the upper portions of which have been removed by denudation, so that the truncated strata crop out at the surface (see OUTCROP, STRIKE). The simplest form of curve assumed by strata is a monocline but anticlinal and synclinal folds occur much more frequently (see ANTICLINE). In strata with a moderate dip the strata on opposite sides of an anticlinal axis incline at approximately the same angle. But in more steeply inclined beds the dip is often greater on one side than the other, the beds on the steeper side of the fold becoming doubled in below their equivalents on the other side. This is what is termed 'Inversion'—a structure which when repeated gives us what are called 'Isoclinal Folds' (see MOUNTAINS). In regions of highly folded strata the fossils and even the stones in conglomerates are often flattened and squeezed out of shape. Such *deformation* likewise characterises whole rock-masses, as is well seen in the structure termed Slaty Cleavage (q.v.). As an extreme result of enormous pressure we occasionally find that clastic rocks have been converted into crystalline schists.

Most rocks, as well igneous as derivative, become gradually more and more consolidated. Soft incoherent sands and clays are compressed; lavas cool and harden. All rocks therefore tend to contract, and in doing so they become cracked, regularly or irregularly as the case may be. During the process of folding they have likewise yielded to stress and strain by cracking across. Such cracks are termed Joints (q.v.). But rocks are not only jointed; frequently they are traversed by great fissures of displacement called Faults or Dislocations (q.v.), which may sometimes be traced across the whole breadth of a country. That the phenomena of folding, fracturing, and displacement are the result of earth-movements cannot be doubted, and there is abundant evidence to show that such disturbances have taken place again and again, sometimes over limited regions, at other times over very much wider areas. This is proved by the phenomena of Unconformity (q.v.), in which one set of beds rests on the upturned and denuded ends of an older series.

The fissures and cavities of rocks are in some places filled up again by the introduction of various kinds of mineral matter through the chemical action of percolating water. In many cases such mineral deposition may have taken place from heated solutions, under great pressure, and at great depths from the surface. This is probably the origin of many of the Ore-deposits (q.v.) met with as lodes or veins.

PALÆONTOLOGICAL GEOLOGY.—A study of the physical characters of rocks enables the geologist to arrive at many interesting conclusions as to the mode in which rocks have originated. By such evidence alone it is sometimes possible to discover the successive changes which some particular region has undergone. Thus, the phenomena of igneous and glacial accumulations tell their own story, and even in the case of many sedimentary deposits geologists are able, without the aid of fossils, to distinguish between deep-sea and shallow-water strata; while certain rock-structures, such as unconformity, yield him evidence of changing physical conditions. Without fossils, however, investigations into the successive phases through which the earth's surface has passed could not proceed far: historical geology would be impossible. It is chiefly by means of Fossils (q.v.) that the deep-sea or shallow-water origin and the marine or fresh-water character of strata are determined, and the climatic conditions under which they were deposited are ascertained. When we learn that many fossils belong to extinct species and even genera, and that different groups of fossils occur in different series of strata, it might seem, at first, as if this would tend rather to confuse than aid the geologist. But the cause of such apparent discrepancies lies, of course, in the simple fact that the fossiliferous strata belong to different ages—some are much older than others. In the uppermost or youngest series the organic remains approach most nearly to the life-forms of the present day, while in the lower and therefore older strata the fossils recede farther and farther from existing types as we follow them to lower and lower geological horizons. From this it would appear that there has been a gradual coming-in and dying-out of species, and observation has shown that when a particular flora or fauna has died out it never reappears in younger strata. When William Smith discovered that each well-marked group of strata was charac-

terised by its own suite of fossils he had got the key to the history of a long succession of geological changes; for the fossils enabled him to recognise each group in whatever part of the country it occurred, and however much its petrographical character might have changed. If three conformable series of strata occur in the order A, B, C—B superimposed on A, and C upon B, that order is never reversed elsewhere. Each term of the series may not always be present—either one or more may be absent—but those that do occur always occupy the same relative position. In such a conformable sequence each group may contain fossils peculiar to itself, but a larger or smaller number will usually be found to range from one group to another, or even from top to bottom of the whole. The fossils will, in short, indicate a gradual change of fauna and flora, as we pass from below upwards—old forms disappearing, new forms appearing. But should the middle term of the series (group B) be wanting, then the passage from A to C, owing to the absence of the connecting forms belonging to B, will be more or less abrupt. A conformable sequence, like A, B, C, points to the persistence of similar physical conditions during a longer or shorter period. If the fossils in each group indicate a sea of moderate depth while the stratum attains a thickness of several thousand feet, the inference will be that sedimentation has taken place during a slow movement of subsidence. In other words, the silting-up of the sea has been retarded by the gradual sinking-down of its bottom. On the supposition that the accumulation of the strata has been a very protracted process, the marine fauna will have undergone more or less modification. Such change in the life-forms, however, will probably have been very gradual; some species remaining longer unmodified than others, while a few may persist unchanged through the whole period of sedimentation. In the case of an unconformable sequence—where C rests directly on A, the physical conditions have evidently not remained constant. After the deposition of A, a movement of upheaval has ensued; the sea has disappeared and land has taken its place. Should land-conditions have continued for a very prolonged period before subsidence supervened and the area once more became submerged, the marine fauna will, in the meantime, have undergone more or less modification in those regions to which it migrated while elevation was in progress. Thus the sediment (group C) which subsequently accumulated over the drowned land-surface would come to contain a suite of organic remains that might differ greatly from those occurring in the immediately subjacent group A. And the longer the interval between A and C, the more strongly marked would be the break in the succession of life-forms. Such 'breaks in the succession' are of common occurrence—local and more widely-spread movements of depression and elevation having characterised the formation of the fossiliferous strata everywhere. When it is remembered that every bed of aqueous rock has been formed out of the ruins of pre-existing rocks, igneous or derivative, or both, it is obvious that the fossiliferous strata cannot possibly contain a perfect record of all the forms of life which may originally have been entombed in sediment. Many fossils must have disappeared along with the rocks which contained them. Thus, in the case of such a 'break in succession' as that just described, it is obvious that the strata of group A would be more or less denuded before group C began to be accumulated—C would rest unconformably upon A. Nor can we believe that the life-forms of earlier ages were ever more fully represented by fossils than existing faunas and floras will be by the remains of living things which are now being buried in sediment. Of the myriads of existing terrestrial plants and animals how few will leave any relic behind them! Aquatic, and more especially marine forms, will doubtless be preserved in far greater variety and abundance; but amongst these are many delicately-fashioned and soft-bodied creatures which can only become fossils by accident, as it were. Such considerations as these should lead us to expect that the fossiliferous strata, even when these have apparently been accumulated in a continuous manner, will contain a most imperfect record of the past life-history of the globe. But notwithstanding this imperfection of the geological record there is yet ample evidence to show that gradual extinction of old and evolution of new faunas and floras has been the rule. Life has been persistent from its introduction, but subject to endless modifications. With this continuity in geological history it is obvious that any subdivisions of past time that we choose to make must be arbitrary, for the germ, as it were, of one so-called period must have begun in the period that preceded. But, just as in human history it is convenient to use such terms as the 'Middle Ages,' the 'Elizabethan Period,' &c., so in geology it is useful and indeed necessary, for purposes of description and correlation, to group the records into so many subordinate divisions. 'Unconformities,' 'breaks in succession,' &c. often enable this to be done with more or less ease; but in the case of the better-preserved portions of the stony record it is often very hard to say where a division-line should be drawn.

Historical Geology.—The forms of life that existed during some prolonged period of the past have a certain *facies* which serves to distinguish them as a group from the living things that flourished in preceding and succeeding ages. And the strata which contain such a well-marked assemblage of fossils are included under the term *System*. By this term, then, is understood all the deposits, whether terrestrial, fresh-water, or marine, which accumulated over the earth's surface upon land, in lakes, or in the sea, at a time when the world was characterised by the presence of some particular and peculiar fauna and flora. By comparing and correlating the fossiliferous strata throughout the world geologists have been able to arrange the various systems in chronological order. The following table shows the larger divisions and subdivisions in the order in which they would appear if they all occurred in one and the same section. (Each system will be found described under its own title.)

4. Quaternary or Post-Tertiary.	Recent System. Pleistocene "
3. Tertiary or Cainozoic.	Pliocene " Miocene " Oligocene " Eocene "
2. Secondary or Mesozoic.	Cretaceous " Jurassic " Triassic "
1. Primary or Palæozoic.	Permian " Carboniferous System. Old Red Sandstone and Devonian System. Silurian System. Cambrian " Archæan "

Physiographical Geology.—Under this head is discussed the origin of the surface-features of the land—mountains, valleys, &c. The study of causes now in action shows that everywhere rocks are undergoing disintegration, the resulting detritus gradually travelling from higher to lower levels until eventually it reaches the sea. This continuous and universal denudation is easily read in the present appearance of the rocks forming the surface of the land. The phenomena of truncated strata, faults, &c. (see Denudation) demonstrate

that thousands of feet of rock have been gradually removed in the form of detritus. To appreciate this fact some knowledge of structural geology is necessary. In regions which have long been exposed to denudation we recognise a very remarkable connection between the configuration of the ground and the nature and mode of arrangement of the rocks. The valleys and low grounds, for example, coincide in a general way with the distribution of the less durable rocks, while escarpments, hills, and ridges mark out the sites of the more resisting rock-masses. Again, in the case of undulating and folded strata, it most frequently happens that anticlines instead of forming hills give rise to valleys, while synclines correspond as a rule not to valleys but to hills. The reasons are obvious, for relatively hard rocks resist denudation better than softer rocks; and, while an anticlinal arrangement and the jointing of strata favour the action of the denuding agents, in the case of synclinal strata the rock-structure has just the opposite effect (see LANDSLIPS, MOUNTAINS). Thus the features impressed upon the land by denudation depend partly upon the composition and texture of the rocks, and partly upon their structure as rock-masses. In the case of a true mountain-range of recent elevation the larger features of the surface correspond in a general way with the folds of the strata. Thus the mountain-ridges often run in the direction of great anticlinal axes, while the long parallel valleys coincide with synclinal axes (see ALPS). But even in the case of mountains of elevation denudation has often profoundly modified such features. Anticlinal mountains are very unstable; rock-falls and landslips from time to time take place; and the tendency is for all mountains of that character to become effaced. Sooner or later the orographical features change, and are eventually determined by the epigene agents, directed and controlled by the composition and structure of the various rock-masses. Geologists recognise three kinds of mountains: (1) *Mountains of Accumulation*, such as volcanoes; (2) *Mountains of Upheaval*, such as true mountain-ranges like the Alps; and (3) *Mountains of Circum denudation*, which owe their origin to the removal of material that formerly surrounded them, such as the mountains of the British Islands.

A *plateau* or tableland is simply an elevated plain, and may consist either of approximately horizontal sheets of rock, like the plateau of the Colorado, or of more or less highly folded and even contorted strata, which have been planed down to one general level, like the plateaus of Scandinavia and the Scottish Highlands. Both kinds of tableland are usually traversed by valleys, which have been excavated by running water, and sometimes, as in the case of the Scottish Highlands, they are so highly denuded that their plateau-character becomes obscure. Plateaus owe their elevation to upheaval, those which are built up of horizontal strata being termed *plateaus of accumulation*, while those which consist of folded and contorted strata are known as *plateaus of denudation*. *Plains* are only less elevated plateaus. Some of these, as, for example, the wide alluvial plains and deltas of great rivers, owe their origin to accumulation. Others, again, consist of low-lying land, the level of which has been reduced during a protracted period of denudation. Should such an area eventually be elevated it would become a plateau of denudation.

SPECULATIVE GEOLOGY.—There are certain great physical problems the data for solving which are more or less incomplete, or in the very nature of things beyond our knowledge. Amongst such is the question of the *age of the sun's heat*. This, of course, is rather a physical than a geological question, and yet geology furnishes evidence on the subject which the physicist cannot ignore. Some physicists are of opinion that the sun's heat is due to gravitation—that, as Sir W. Thomson remarks, the sun's matter, before it came together and became hot, may have existed in the condition of two cool solid bodies which collided with the velocity due to their mutual gravitation. If gravitation, therefore, be the only source of the sun's heat, that luminary cannot have been giving out heat at the present rate of radiation for a longer period than 20,000,000 years, or, as Professor Tait maintains, 10,000,000 years. But no geologist will admit that all the changes that have taken place on the earth's surface since the first appearance of life can possibly be included within such narrow limits. According to Dr Croll, however, the sun probably originated from the collision of two bodies moving directly towards each other with velocities greater than the velocities due to their mutual gravitation. As the heat generated by the impact of two such bodies would depend upon the velocity possessed by each before collision took place, it is obvious that the energy stored up in our sun may be infinitely greater than that which could have been derived from gravitation alone. So far, therefore, as a possible source of the sun's energy is concerned, Dr Croll is of opinion that life might quite well have begun 100,000,000 years ago.

Condition of the Earth's Interior.—This is another physical problem in the solution of which geology is necessarily interested. Several views have been advanced by physicists, the more generally received opinion being that the earth is a more or less solid globe. Others favour the hypothesis of a thin crust enclosing a liquid or viscous interior; while yet others think that a liquid substratum separates the crust from a solid nucleus. The appearance of volcanoes and thermal springs shows us that a high temperature exists beneath the crust, and similar evidence of internal heat is furnished by borings and mines. The mean of many observations shows that temperature increases 1° F. for every 54 feet of descent, so that if the temperature at the surface be 50°, the boiling-point of water (212°) will be reached at the depth of about a mile and a half. It is evident, therefore, that at a comparatively short distance from the surface the heat would be sufficient (at atmospheric pressure) to melt all kinds of mineral matter with which we are acquainted. It is supposed, however, by those who maintain that the earth is solid throughout, that the substance of the earth's interior is kept from liquefying by pressure. So far as geological facts go they are opposed to the view of a solid globe or of an enormously thick crust. The folding and contortion of strata seem to imply the presence of an underlying yielding mass upon which the solid crust may have a certain freedom to move during the shrinking and contraction that must result from the secular cooling of the earth (see EARTH, MOUNTAINS).

The *origin of volcanic action* has also been a much-canvassed question, and is variously explained according as the hypothesis of a solid or of a viscous interior is held to be the more probable (see VOLCANOES). Closely connected with such problems is that of the *origin of oceanic basins and continental areas*. Of late years the belief has gained ground that these dominant features of the earth's surface are of primeval antiquity—that in their origin they antedate the oldest of the sedimentary formations. It is a remarkable fact that hitherto, amongst the various formations that enter into the composition of the land of the globe, no trace of any abysmal accumulations has been met with. On the contrary, the aqueous rocks appear to have been deposited as a rule in relatively shallow seas. Many oscillations of level have taken place at successive periods within each continental area, by which the extent and outline

of the land have been again and again modified, but the great continental ridges, according to the geological evidence, would appear to have persisted from the earliest times as dominant elevations of the earth's crust. 'The continents,' as Professor Dana remarks, 'have never changed places with the oceans.' See ABYSMAL ACCUMULATIONS.

Changes of Climate.—The geological record everywhere bears testimony to the fact that the climate of the globe has from time to time undergone changes. In our day climate is differentiated into zones; there is a marked change in the temperature as we pass from the equator to the poles. Latitude, and the relative positions of the great land and water areas, are doubtless the chief factors in the determination of the present climates of the globe, and must have had a similar influence on the climate of much older periods. Sir Charles Lyell and others have held, therefore, that such climatic vicissitudes as we have evidence of in the fossiliferous strata were probably induced by changes in the distribution of land and sea. Others have doubted whether this will explain the facts. If it be true that the great continental ridges are of primeval antiquity, then continents and seas could not have changed places, as Lyell supposed. The climatic conditions of the Glacial Period (q.v.) cannot possibly be due to such revolutions, for the distribution of land and sea during Pleistocene times was practically the same as at present. Stated briefly, the facts of geological climate are these: In Palæozoic ages the climate would appear to have been singularly genial and uniform over the globe. All through Mesozoic times similar genial conditions seem to have extended from what are now temperate up to polar regions. But the evidence indicates apparently that the climate of the latter was somewhat less genial than that of more southern latitudes. In Cainozoic ages, likewise, the climate continued to be mild even in high Arctic lands, but towards the close of the Tertiary era a general lowering of the temperature took place. Thereafter followed the Quaternary period with its extraordinary climatic changes (see GLACIAL PERIOD, PLEISTOCENE SYSTEM). It is possible, as some suppose, that the uniform climates of the earlier geological periods may have been due in part to the former greater heat of the earth. But probably the chief factor was the peculiar disposition of land and water. The continental areas appear for long ages to have been represented by groups of larger and smaller islands—a condition of things which would allow of the more or less free circulation of oceanic currents round the world. Under such conditions atmospheric temperature and pressure would have a very different distribution from the present. It can hardly be doubted, also, that cosmical causes must have had some influence upon former climates. Dr Croll believes that the strongly contrasted climates of the Pleistocene period (glacial and interglacial epochs) were the indirect result of increased eccentricity of the earth's orbit combined with the precession of the equinox. It has been objected to this theory that we have no evidence in the older geological periods of such remarkable climatic changes, which, if the theory be true, ought to have happened again and again during preceding periods of high eccentricity of the orbit. We are not, however, without evidence of ice-action in Palæozoic, Mesozoic, and Cainozoic times. The evidence is not abundant, but, considering the conditions of sedimentation, it is perhaps as much as could have been expected. It is doubtful, however, whether the arrangement of land and water in our hemisphere at any period anterior to later Cainozoic times could have favoured such enormous accumulations of snow and ice as those of the Pleistocene. When the continents were represented by groups of islands, the conditions for the massing of such great icefields could not have existed. And, if it be true that the climate of the globe in the earliest geological ages was influenced by the greater internal heat of the earth, the effects flowing from great eccentricity of the orbit might often be modified or neutralised.

Among the many subjects connected with geology which have separate articles assigned to them in this work, not to speak of the sections on the geology of Europe, Asia, Africa, America, Australia, and the several countries, are the following:

Abyssmal Accumulations.	Mineralogy.
Archæan System.	Miocene System.
Artesian Wells.	Mountains.
Ásar.	Old Red Sandstone.
Boulder-clay.	Oligocene System.
Cambrian System.	Ore Deposits.
Carboniferous System.	Palæontology.
Caves.	Peat.
Coal.	Permian System.
Coral Islands.	Petrography.
Cretaceous System.	Pleistocene System.
Denudation.	Pliocene System.
Dislocations.	Postglacial System.
Drift.	Sand.
Earthquakes.	Sea.
Eocene System.	Silurian System.
Fossils.	Springs.
Glacial Period.	Strata.
Joints.	Triassic System.
Jurassic System.	Unconformity.
Lakes.	Upheaval and Depression.
Landslips.	Volcanoes.

See, for General Geology, Lyell's *Principles of Geology* (1876); De la Beche's *Geological Observer* (1853); Lyell's *Elements of Geology* (1865); A. Geikie's *Text-book of Geology* (1887); Prestwich's *Geology* (2 vols. 1886–88); Phillips' *Geology*, edited by Etheridge and Seeley (2 vols. 1885); Green's *Physical Geology* (1882). The following are less elaborate treatises: Lyell's *Student's Elements of Geology* (1885); A. Geikie's *Class-book of Geology* (1886); J. Geikie's *Outlines of Geology* (1888); Jukes-Brown's *Handbook of Geology* (2 vols. 1884–86); Page and Lapworth, *Introductory Text-book of Geology* (1888). Of American and continental text books may be mentioned: Dana's *Manual of Geology* (1875); Le Conte's *Compend of Geology* (1884); Credner's *Elemente der Geologie* (1887); Naumann's *Lehrbuch der Geognosie* (3 vols. 1858–72); *Allgemeine Erdkunde*, by Hann, Von Hochstetter, and Pokorny (1881); De Lapparent's *Traité de Geologie* (1884); Stoppani's *Corso di Geologia* (1871). Hutton's *Theory of the Earth* (1795) is interesting as containing the groundwork of the modern system of geology. See also Playfair's *Illustrations of the Huttonian Theory* (1822). Of works dealing with special branches of geology the following may be cited: For Cosmical Aspects of Geology, see Sir W. Thomson, 'On the Age of the Sun's Heat,' in *Popular Lectures and Addresses* (vol. i. 1889); Croll's *Climate and Time* (1875), *Climate and Cosmology* (1885), and *Stellar Evolution* (1889). For Petrographical Geology, see references under PETROGRAPHY. For Dynamical Geology, see Darwin's *Geological Observations on Volcanic Islands* (1884), and *Observations on South America* (1846; both works in 1 vol. 1876); Scrope's *Volcanoes of Central France* (1858), and *Volcanoes* (1872); Judd's *Volcanoes* (1881); R. and J. W. Mallet's *Earthquake Catalogue* (1858); Milne's *Earthquakes* (1886); Fuchs's *Vulcane und Erdbeben* (1875); Fouché's *Les Tremblements de Terre* (1888); Twelfth Annual Report of U.S. Geological and Geographical Survey of the Territories (1883; for Geysers); Fisher's *Physics of the Earth's Crust* (1882); T. G. Bonney, *The Story of our Planet* (1894); Bischoff's *Chemical and Physical Geology* (1854–59), and the Supplement (in German, 1871); Roth's *Allgemeine und chemische Geologie* (1879); Agassiz' *Études sur les Glaciers* (1840); Forbes's *Travels through the Alps* (1843), and *Papers on the Theory of Glaciers* (1849); Tyndall, *The Glaciers of the Alps* (1857); Darwin's *Vegetable Mould and Earthworms* (1881), and *Coral Reefs* (1874); Dana's *Corals and Coral Islands* (1875). Further references to special works dealing with dynamical geology will be found in the larger text-books of geology. For Structural or Geotectonic Geology, consult

the standard text-books of geology; see also article STRATUM. For Experimental Geology, see Daubrée's *Études Synthétiques de Géologie Expérimentale* (1879). For works dealing with Palæontology, see under that article. For Physiographical Geology, see Memoirs of Geological Surveys of British Islands, *passim*. Ramsay's *Physical Geography and Geology of Great Britain* (1878); A. Geikie's *Scenery and Geology of Scotland* (1889); Hull's *Physical Geography and Geology of Ireland* (1878); Dutton's 'Tertiary History of the Grand Cañon District,' *Monographs of U.S. Geol. Survey* (vol. II. 1882); also Annual Reports of U.S. Geol. and Geograph. Survey of Territories (1867–78), *passim*; De la Noë and De Margerie, *Les Formes du Terrain* (1888). For Geology of British Islands, see Maps and Memoirs of the Geological Survey; works by Ramsay, A. Geikie, and Hull already cited; Woodward's *Geology of England and Wales* (1887); Kinahan's *Geology of Ireland* (1878); Murchison's *Silurian* (1867); Macculloch's *Western Islands of Scotland* (1819); Nicol's *Guide to the Geology of Scotland* (1844)—these last two works rather out of date; Miller's *Old Red Sandstone* (1858); Green, Miall, and others, *Coal its History and Uses* (1878); Hull's *Coalfields of Great Britain* (1881); Meade's *Coal and Iron Industries of the United Kingdom* (1882); Phillips' *Geology of Oxford and the Valley of the Thames* (1871), and *Geology of the Yorkshire Coast* (1875); Tate and Blake, *The Yorkshire Lias* (1876). For further references to treatises dealing with the geology of England and Wales, see especially Woodward's work cited above. The following works deal with Pleistocene Geology and the Antiquity of Man: Lyell's *Antiquity of Man* (1873); Lubbock's *Prehistoric Times* (1878); Evans' *Ancient Stone Implements of Great Britain* (1872); Dawkins' *Cave-hunting* (1874), and *Early Man in Britain* (1880); J. Geikie's *Great Ice Age* (1877), and *Prehistoric Europe* (1881). Dawson, *The Earth and Man* (1887); De Quatrefages, *The Human Species* (1879); Joly's *Man before Metals* (1883); Penck's *Die Vergletscherung der deutschen Alpen* (1882); Falsan, *La Période Glaciaire* (1889); Wright's *Ice Age in North America, &c.* (1889). For treatises bearing on Geological Climate, see Croll's works already cited; also J. D. Whitney, *The Climatic Changes of Later Geological Times* (1882). Amongst works on Economic Geology the following may be mentioned: Page's *Economic Geology* (1874); Williams' *Applied Geology* (1886); Penning's *Engineering Geology* (1880); Nivoit's *Géologie appliquée à l'Art de l'Ingénieur* (1887). For methods of geological observation and the making of geological maps, see the larger text-books, Sir A. Geikie's *Outlines of Field Geology* (1879), and Penning's *Field Geology* (1876). Sir A. Geikie, *The Founders of Geology* (1897), deals with Desmarest, Guettard, and other early geologists.

Geomancy. See DIVINATION.

Geometrical Mean of two numbers is that number the square of which is equal to the product of the two numbers; thus, the geometrical mean of 9 and 16 is 12, for $9 \times 16 = 144 = 12^2$. Hence the geometrical mean of two numbers is found by multiplying the two numbers together, and extracting the square root of the product.

Geometrical Progression. A series of quantities is said to be in geometrical progression when the ratio of each term to the preceding is the same for all the terms—i.e. when any term is equal to the product of the preceding term and a factor which is the same throughout the series. This constant ratio or factor is termed the *common ratio*. For example, the numbers 2, 4, 8, 16, &c., and also the terms a, ar, ar^2, ar^3, &c., are both examples of geometrical progression or series. The sum of such a series is obtained as follows: Let a be the first term, n the number of the terms whose sum, s, is required, and let r be the common ratio. Then $s = a + ar + ar^2 + \ldots + ar^{n-1}$; also from multiplication of both sides of this equation by r, $sr = ar + ar^2 + ar^3 + \ldots + ar^n$. Subtraction of the former from the latter expression gives $sr - s = ar^n - a$; or $s(r-1) = a(r^n - 1)$, and hence $s = \frac{a(r^n - 1)}{r - 1}$.

Geometry is that branch of the science of mathematics which treats of the properties of space. When the properties investigated relate to figures described or supposed to be described on space of two dimensions, there arise such subdivisions as plane and spherical geometry, according to the surface on which the figures are drawn. If the properties relate to figures in space of three dimensions they fall under what is called solid geometry, or now more frequently, geometry of three dimensions. Again, from the mode in which the properties of figured space are investigated, arise two other subdivisions, pure and analytical geometry. The somewhat arbitrary subdivision into elementary and higher geometry arises from the fact that the geometrical books of Euclid's celebrated work, the *Elements*, treated only of plane figures composed of straight lines and circles, of solid figures with plane faces, and of the three round bodies, the sphere, the cylinder, and the cone.

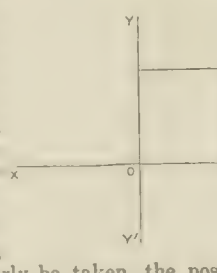
Other subdivisions of geometry arise from the threefold classification that may be made of the properties of space. These properties may be topological, graphical, metrical. The first class of properties are independent of the magnitude or the form of the elements of a figure, and depend only on the relative situation of these elements. Perhaps the simplest example that could be given of this class of properties is that if two closed contours of any size or shape traverse one another, they must do so an even number of times. No systematic treatise on this part of geometry has ever been drawn up, and it is only in papers scattered here and there in scientific journals that contributions towards such a treatise are to be found. The principal names under which such contributions are to be looked for are Euler, Gauss, Listing, Kirkman, and Tait.

The graphical or projective properties of space, which constitute the subject of projective geometry, are those which have no reference to measurement, and which imply only the notions of a straight line and a plane. A simple example of this class of properties is the well-known theorem of Desargues: If two triangles be situated so that the straight lines joining corresponding vertices are concurrent, the points of intersection of corresponding sides are collinear, and conversely.

The metrical properties of space are those which are concerned with measurement. An example of a metrical property is the theorem of the three squares: The square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the two sides. The geometry of Euclid's *Elements* is metrical.

Descriptive geometry is not so much a part of science as an art. It has for its object to represent on a plane which possesses only two dimensions, length and breadth, the form and position in space of bodies which have three dimensions, length, breadth, and height. This object is attained by the method of projections.

Analytical geometry is a method of representing curves and curved surfaces by means of equations. Before showing, however, how a curve can be represented by an equation, it will be necessary to explain what is meant by the coordinates of a point. If two axes, XX′, YY′, cutting each other perpendicularly be taken, the position of a point P in the same plane as the axes is determined,



if we know the distances of P from XX′ and YY′—i.e. if we know MP and OM. OM is called the abscissa, MP the ordinate of the point P, and the two together are called the co-ordinates of P. It is usual to denote OM and MP by x and y. If the point P be supposed to move in the plane according to some law, a certain relation will exist between its co-ordinates; this relation expressed in an equation will be the equation to the curve traced out by P. To take a simple example. Let the law according to which P moves be that its distance from XX′ shall always be double its distance from YY′; then the equation to the curve traced out by P will be $y = 2x$. If it be required to draw the curve traced out by P, we may assume any values for x, and from the equation determine the corresponding values for y. If we assume the values 1, 2, 3, &c. for x, the corresponding values of y will be 2, 4, 6, &c. Determine then the points whose co-ordinates are 1 and 2, 2 and 4, 3 and 6, &c.; these will be points on the curve. It is not difficult to discover that the curve is in this instance a straight line.

If the law according to which P moves in the plane be that it shall always be at the same distance from a fixed point, we have only to specify the distance (say c), and the co-ordinates of the fixed point (say a and b), and we shall find the equation which expresses this law to be

$$(x - a)^2 + (y - b)^2 = c^2.$$

If the distance be c, and the fixed point be the origin O whose co-ordinates are 0 and 0, the equation will be

$$x^2 + y^2 = c^2.$$

These last two equations are those of a circle.

As two co-ordinates are sufficient to determine a point in a plane, so a plane curve described according to a certain law will be represented by an equation between two variables, x and y; viz. $F(x, y) = 0$. It may be mentioned that equations of the first degree represent straight lines, those of the second degree represent some form of a conic section, those of higher degrees represent curves which in general take their name from the degree of their equations. The position of a point in space is fixed when its distances from three planes, usually taken perpendicular to each other, are known; in other words, three co-ordinates x, y, z determine a point in space. Hence, if a curved surface is given in form and position, and we can express algebraically one of its characteristic properties, and obtain a relation $F(x, y, z) = 0$ between the co-ordinates of each of its points, this equation is the equation of the surface; and every equation $F(x, y, z) = 0$, whose variables x, y, z are the co-ordinates of a point referred to three planes, perpendicular or oblique to each other, represents some surface, the form of which depends on the way in which the variables are combined with each other and with certain constant quantities.

The system of co-ordinates explained above is called the Cartesian, from Descartes. There are other systems, but a concise account of them would be unintelligible.

Of the history of geometry only the briefest outline can be given here, and this outline must be restricted mainly to pure geometry. Tradition ascribes (and modern research tends to confirm rather than to invalidate the ascription) the origin of geometry to the Egyptians, who were compelled to invent it in order to restore the landmarks effaced by the inundation of the Nile, but our knowledge of their attainments is meagre. From a papyrus in the British Museum written by Ahmes, possibly about 1700 B.C., we infer that the Egyptians discussed only particular numerical problems, such as the measurements of certain areas and solids, and were little acquainted with general theorems. The history of geometry, therefore, as a branch of science begins with Thales of Miletus (640–542 B.C.). The principal discovery attributed to him is the theorem that the sides of mutually equiangular triangles are proportional. After Thales came Pythagoras of Samos (born about 580 B.C.). It is difficult to separate the contributions which Pythagoras made to geometry from those of his disciples, for everything was ascribed to the master. The Pythagoreans appear to have been acquainted with most of the theorems which form Euclid's first two books, with the doctrine of proportion at least as applied to commensurable magnitudes, with the construction of the regular solids, and to have combined arithmetic with geometry. The theorem of the three squares, one of the most useful in the whole range of geometry, is known as the theorem of Pythagoras. Hippocrates of Chios, who reduced the problem of the duplication of the cube to that of finding two mean proportionals between two given straight lines; Archytas of Tarentum, who was the first to duplicate the cube; Eudoxus of Cnidus, the inventor of the method of exhaustions and the founder of the doctrine of proportion given in Euclid's fifth book; Menæchmus, the discoverer of the three conic sections; Deinostratus and Nicomedes, the inventors of the quadratrix and the conchoid; and Aristæus, are the principal predecessors of Euclid. To Euclid (about 300 B.C.) is due the form in which elementary geometry has been learnt for many centuries, and his treatise, the *Elements*, seems to have completely superseded all preceding writings on this subject. Those books of this treatise which are concerned with geometry are so well known that it is superfluous to refer to their contents. Archimedes of Syracuse (287–212 B.C.) is the greatest name in Greek science. Besides his important contributions to statics and hydrostatics, he wrote on the measurement of the circle, on the quadrature of the parabola, on the sphere and cylinder, on conoids and spheroids, and on semi-regular polyhedrons. Apollonius of Perga (260–200 B.C.) wrote on several geometrical subjects, but the work which procured him in his lifetime the title of 'the great geometer,' was his treatise on the conic sections. Ptolemy, author of the *Almagest*, Hero, and Pappus are the last important geometers belonging to the Alexandrian school.

After the destruction of Alexandria (about 640 A.D.) the study of geometry underwent a long eclipse. The Romans contributed nothing either to geometrical or indeed to any kind of mathematical discovery. The Hindus from the 6th to the 12th century A.D. cultivated arithmetic, algebra, and trigonometry, but in geometry they produced nothing of any importance. A somewhat similar statement may be made regarding the Arabs, but it ought to be remembered that they translated the works of the great Greek geometers, and it was through them that mathematical science was in the 12th century introduced into western Europe. From that time till the close of the 16th century, though editions of the Greek geometers were published and commented on, little or no advance was made in geometry comparable to what took place in other branches of pure or applied mathematics.

In the beginning of the 17th century Kepler and Desargues laid the foundations of modern pure geometry, the former by his enunciation of the principle of continuity, and by his extension of stereometry to solids of which the spheroids and conoids of Archimedes were particular cases, the latter by his introduction of the method of

projection. In 1637 Descartes gave to the world his invention of analytical geometry, thus placing in the hands of mathematicians one of the most powerful instruments of research, and withdrawing their attention from pure geometry. Pascal (1623–62), whose extraordinary precocity has often been cited, wrote an essay on conic sections at the age of sixteen. He afterwards wrote a complete work, one of the properties of which is the theorem of the mystic hexagram. His last work was on the cycloid. With the mere mention of the names of Wallis, Fermat, Barrow, Huygens, we pass to Newton, whose great work, the *Principia*, is the glory of science. Chasles thinks Newton's best title to fame is that he has raised such a monument of his genius by the methods and with the resources of the geometry of the ancients. The names of Halley, Maclaurin, Robert Simson, and Euler bring us down to near the end of the 18th century. During the 19th century a revival of interest in pure geometry has been brought about by Monge, the inventor of descriptive geometry, by Carnot, the author of the theory of transversals, by Poncelet and Gergonne. These have been succeeded by Möbius, Steiner, Chasles, and Von Staudt.

The best works on the history of Greek Geometry are Allman's *Greek Geometry from Thales to Euclid* (1889); Paul Tannery's *La Géométrie Grecque* (1887); Bretschneider's *Die Geometrie und die Geometer vor Euklides* (1870). Chasles's *Aperçu historique sur l'Origine et le Développement des méthodes en Géométrie* (1837 or 1875) and his *Rapport sur le Progrès de la Géométrie* (1870) embrace the whole field of Geometry. The following more general histories may also be consulted: Cantor's *Vorlesungen über Geschichte der Mathematik* (1880); Hoefer's *Histoire des Mathématiques* (1874); Marie's *Histoire des Sciences Mathématiques et Physiques* (12 vols. 1883–88); Montucla's *Histoire des Mathématiques* (1802); Gow's *Short History of Greek Mathematics* (1884); and Ball's *Short Account of the History of Mathematics* (1888).

George, a division of the western province of Cape Colony, on the south coast, east of Capetown. It contains 2600 sq. m., and about 11,000 inhabitants. It is valuable chiefly for its pasturage and its timber. The town of George stands 6 miles N. of the coast, and has a population of over 2000. On the coast is the port of Mossel Bay.

George, ST, the especial patron of chivalry, and tutelary saint of England. Although venerated both in the Eastern and Western churches, his history is extremely obscure, the extant accounts containing very much less history than legend. The story in the *Acta Sanctorum* is that he was born of noble Christian parents in Cappadocia, became a distinguished soldier, and, after testifying to his faith before Diocletian, was tortured and put to death at Nicomedia, April 23, 303. By many writers, as by Gibbon, he has been confounded with the turbulent and unscrupulous Arian partisan, George of Cappadocia, who after a troubled life as army contractor and tax-gatherer became Archbishop of Alexandria, and after five years of misgovernment was torn in pieces by a furious mob. Most authorities, Catholic and Protestant, agree in admitting the great improbability of this identification. Dr Peter Heylin is of one mind in this matter with the Jesuit Papebroch, and Dean Milman with the Roman Catholic Bishop Milner. Whatever may be said of the unhistorical character of St George's martyrdom, the fact of his being honoured as a martyr by the Catholic Church, of churches being dedicated to him, and of the Hellespont being called 'St George's Arm,' is traced by Papebroch, by Milner, and by other writers to so early a date, and brought so immediately into contact with the times of the angry conflicts in which George of Cappadocia figured as an Arian leader, that it is impossible to believe that the Catholics of the East—while the tomb of Athanasius was hardly closed upon his honoured relics—would accept as a sainted martyr his cruel and unscrupulous persecutor. The St George of the Eastern Church was no doubt a real personage of an earlier date than George of Cappadocia, but beyond this we can say nothing of him. His name was early obscured in fable—one oriental story making him suffer as many as seven martyrdoms, reviving after each save the last. The same story exists even in Mussulman legends, whose Chwolson identifies the hero with the Semitic Tammuz.

The famous story of St George's struggle with the dragon is first found in Voragine's *Legenda Aurea*, but soon found its way into the office-books of the church, until left out by Pope Clement VII. To slay a dragon was a common exploit for the saints and heroes of Christendom as well as of Teutonic and Indian antiquity; and St George here touches so closely the common myths of the Aryan family as to have himself been explained, by Baring-Gould and others, as in this aspect merely a mythical form of the sun-god dispelling the darkness by his beams of light.

Churches were dedicated to St George from very early times; the Crusades gave a great impetus to his cultus, and he was adopted as the soldier-saint who led his votaries to battle. Many new chivalrous orders assumed him as their patron, and he was adopted as their tutelary saint by England, Aragon, and Portugal. In 1348 Edward III. founded St George's Chapel, Windsor, and in 1344 the celebrated Order of the Garter was instituted. See Baring Gould's *Curious Myths of the Middle Ages*, and the article DRAGON. The cross of St George, red on a white ground, was worn as a badge over the armour by every English soldier in the 14th and subsequent centuries. For the banner of St George, now represented in the Union flag, see FLAG.

George I., son of Ernest Augustus, Elector of Hanover, and of Sophia, granddaughter of James I. of England, was born in Hanover on 28th May 1660. Immediately after Queen Anne's death on 1st August 1714, he was proclaimed king of Great Britain and of Ireland in London, the proclamation at Edinburgh taking place four days, and at Dublin five days later. He had been Elector of Hanover since 1698, and he was the first monarch of the House of Brunswick who, in accordance with the Act of Settlement, succeeded to the throne of this country. He arrived at Greenwich on 29th September, and was crowned at Westminster on 31st October 1714. He had commanded the imperial forces in the war against France in which Marlborough acquired distinction, and, though less successful than Marlborough as a general, he was as chagrined as he when the Tory party, under the inspiration of Bolingbroke, made peace, and sanctioned the treaty of Utrecht. In 1682 he married his cousin, the Princess Dorothea of Zell. Twelve years later he obtained a divorce on the ground of her intrigue with Count Königsmark, and caused her to be imprisoned in the castle of Ahlden, where she died on 2d November 1726. While punishing his consort for her frailty, he lived openly with mistresses, and was neither ashamed of his conduct nor made to suffer for it.

The Tories and Jacobites who clung to the banished House of Stuart were the objects of his aversion, and the Whigs were favoured by him. Bolingbroke and the Duke of Ormond fled to France; both of them, and Oxford, who remained behind, were impeached. In Scotland a Jacobite rising, headed by the Earl of Mar, took place in 1715; a battle at Sheriffmuir on the 13th November, though indecisive, dispirited the rebels, who afterwards dispersed. Another body marched

into England, proclaimed James king at Penrith, and, being surrounded after reaching Preston, laid down their arms on the day of the battle at Sheriffmuir. The Earl of Derwentwater and Viscount Kenmure were executed on Tower Hill; many others were shot, and many were transported. A year after this abortive rebellion, parliament passed the Septennial Act, in order that by prolonging its own existence for four years the accession of the Tories to power might be hindered. More serious than any rebellion was the rise and fall of the South Sea Scheme (q.v.), the English counterpart of the Mississippi Scheme which beggared France. The king's personal part in the history of the reign was but slight, the actual ruler being Sir Robert Walpole. George I. could not speak English; Lord Granville was the only one of his ministers who could converse with him in German; the king and Walpole interchanged views in bad Latin. On this account the king did not preside at meetings of the cabinet. Queen Anne is the last sovereign of Great Britain who was present at a cabinet council. It was the delight of George I. to live as much as possible in Hanover, and to obtain as much money as possible from Great Britain. He died suddenly at Osnabrück, on his return from Hanover, on 9th June 1727. Lady Wortley Montagu styles George I. 'an honest blockhead.' If he had been an abler man he might have proved a worse sovereign. He was a useful figure-head in a constitutional government, and rendered greater service than he may have intended to the country which adopted him.

See the Histories of England by Stanhope, Hallam, and Lecky; the Stuart *Papers*; the *Life of Walpole*, by Coxe; the *Historical Register*.

George II. succeeded his father as Elector of Hanover and king of Great Britain and of Ireland. Born in Hanover on 30th October 1683, he was created Duke of Cambridge in 1706, and declared Prince of Wales in council in 1714. In 1705 he married Caroline of Anspach, a woman of many attainments and great force of character. She exercised great influence over her husband, and winked at his infidelities. When on her deathbed in November 1737 she implored him to marry again, he replied, with tears in his eyes, that he would rather keep a mistress. Though George interfered more in the government than his father had done, the policy pursued during his reign was first that of Walpole and second that of Pitt. During the greater part of Walpole's administration of the government peace was preserved; during the period that Pitt was almost supreme wars were fought and much glory was gained. In 1743 George II. was present and showed courage at the battle of Dettingen, the last occasion this on which an English sovereign has played a part in actual warfare. The rebellion in 1745 was ended at Culloden, where the adherents of the Young Pretender made their last stand. The Pretender had defeated General Cope at Prestonpans, and marched as far as Derby before succumbing to the royal forces under the command of the king's second son, the Duke of Cumberland, whose cruelty in dealing with the rebels caused him to be stigmatised as 'the Butcher.' The country prospered so well that in 1749 the funds rose above par. Pelham, the Chancellor of the Exchequer, effected a saving by reducing the interest on the national debt from 4 to 3½, and then to 3 per cent. Among the victories which made this reign glorious was that of Clive at Plassey and that of Wolfe at Quebec. The earlier years of the reign are pronounced by Hallam to be 'the most prosperous season that England had ever experienced.' George II. died suddenly on 25th October 1760. He had no conspicuous virtues. He may be credited, however, with a few pointed sayings. One was, 'What a strange country is this! I have never known but two or three men in it who understood foreign affairs.' Another was, 'Confidence is a plant of slow growth in an aged bosom.'

See the Histories of England by Stanhope and by Lecky; *Memoirs of the Reign of George II.*, by Harvey; Dodington's *Diary;* and Horace Walpole's *Memoirs of the last Ten Years of the Reign of George II.*

George III. was the eldest son of Frederick Lewis, Prince of Wales, and was born in London, at Norfolk House, St James's Square, on 4th June 1738. Being a seven-months' child, and very weakly, the boy was not expected to survive, and at eleven at night he was privately baptised by Dr Secker, who was Bishop of Oxford and rector of the parish of St James. On 2d July the bishop performed the ceremony publicly, the boy being named George William Frederick, and his sponsors being the King of Sweden, the Duke of Saxe-Gotha, and the Queen of Prussia. On 25th October 1760 George II. died suddenly, and his grandson ascended the throne. The new king was the first member of the House of Brunswick who commanded general respect on becoming the sovereign over Great Britain and Ireland. At the same time he became Elector of Hanover, a title which was exchanged for that of king in 1815, when he was incapacitated for performing his duties, and unconscious of what passed in the world. He was the only one of the four Georges who never visited his German dominions. In his first speech to parliament he said: 'Born and educated in this country, I glory in the name of Briton, and the peculiar happiness of my life will ever consist in promoting the welfare of a people whose loyalty and warm affection to me I consider the greatest and most permanent security of my throne.' These words were inserted by himself in the speech composed by the Earl of Hardwicke and approved by the ministry. At the outset George III. conciliated all classes of his subjects. Horace Walpole thus describes from personal observation the nature of the change: 'For the king himself, he seems all good nature and wishing to satisfy everybody. All his speeches are obliging. I saw him yesterday, and was surprised to find the levée-room had lost so entirely the air of the lion's den. The sovereign does not stand in one spot with his eyes fixed royally on the ground, and dropping bits of German news. He walks about and speaks freely to everybody. I saw him afterwards on the throne, where he is graceful and genteel, sits with dignity, and reads his addresses well.' On 8th September 1761 he married Charlotte Sophia, Princess of Mecklenburg-Strelitz, his bride being in her eighteenth and he in his twenty-third year. A fortnight after their marriage they were crowned. As a younger man he was supposed to have had children by Hannah Lightfoot, a beautiful Quakeress, and to have married her, but no proof of this marriage has ever been advanced. It is less open to doubt that, after ascending the throne, he wished to marry Lady Sarah Lennox, and that his mother used her influence to bring about a marriage with one who, like herself, was a German princess.

George III. owed it to his mother that he was strongly imbued with a desire to govern as well as reign. 'George, be king,' was the phrase which she repeated, and the training which he had received made him give heed to it. Bolingbroke, in writing the *Idea of a Patriot King*, had the expectation of persuading Frederick, Prince of Wales, and father of George III., to act the part. The substance of Bolingbroke's teaching was that a king should be the father of his people, that he was the man best qualified to know what would be for their good, and the one best entitled to make them do as he deemed right. Thus George III. felt certain that

his own way was the true one, and that were it followed all would go well. The friction which soon became manifest between him and his people was chiefly due to his determination to have his own way. Pitt was the popular idol; but the king disliked Pitt and his policy, and the Earl of Bute became prime-minister in the place of the Duke of Newcastle. It was commonly believed that Bute was both the favourite of the king and the lover of his mother; he was a Scottish nobleman who dispensed patronage to his countrymen, and he was execrated on account of his birth, his position, and his conduct. If he had been a strong man, he might have justified his promotion, but, being both timid and incompetent, he succumbed to popular clamour. His premiership lasted from May 1762 till April 1763. George Grenville, his successor, was premier for two years. The Marquis of Rockingham, who followed him, held the office for eleven months, the Earl of Chatham for fourteen months, and the Duke of Grafton held it for three years. These short-lived administrations were due to the king pitting one section of the Whig party against the other, in order to escape falling under the domination of the great Whig families, the result being that a party was formed which was known as 'the king's friends.' George III. found in Lord North a minister after his own heart, and Lord North remained at the head of the government from January 1770 till March 1782. During the administration of Lord North the thirteen united colonies proclaimed and achieved their independence, and were acknowledged by France and Spain as the United States of America. The determination of the king not to grant any concessions to those whom he deemed rebels caused the struggle to be protracted, and shut the door against compromise while compromise was possible. The subserviency of parliament and the acquiescence of the country enabled the king to have his own way. Lord North was succeeded by the Marquis of Rockingham, who died after he had been three months in office. Among his colleagues were Charles James Fox, Burke, and Sheridan, three of the most brilliant members of the Opposition, and three men whom George III. detested. Lord Shelburne, who was a member of the same administration, took Rockingham's place, but the colleagues just named and others refused to serve with him; on the other hand, he secured the services of William Pitt as Chancellor of the Exchequer. The friends of Charles James Fox and the followers of Lord North coalesced, and overthrew the Shelburne administration after it had been ten months in office; and the Duke of Portland became the head of a coalition ministry which entered office in April 1783, and was compelled to leave it, owing to the underhand action of the king, in December of that year. In the interval the definitive treaty of peace with the United States of America was signed, and the India Bill was brought before parliament, a measure of which Burke was the chief author, Fox the warm advocate, and George III. the irreconcilable foe.

In December 1783 William Pitt, then in his twenty-fourth year, formed an administration in which he was Chancellor of the Exchequer as well as First Lord of the Treasury, and he remained in office for eighteen years. The crushing victory of his party at the general election in 1784 was a triumph for the king as much as for Pitt. From that date there was an end to the supremacy of the old Whig families. The Tory party had been consolidated and was prepared to give effect to the policy of George III. The struggle had been long and severe. John Wilkes had taken part in it, and by his audacious resistance he had led to the abolition of general warrants. The writer whose letters were signed Junius had denounced the ministers whom the king trusted, and had warned the king himself that, as his title to the crown 'was acquired by one revolution, it may be lost by another.' That popular feeling ran high against the sovereign for a time is unquestionable, yet he gradually regained the affections of his subjects; hence, when it was announced in 1788 that he had lost his reason, there was a widespread sympathy with him. His eldest son had displayed vices from which he was free, and the people did not think the substitution of the Prince of Wales for the king would be a gain to the country. Two years before a mad woman, named Margaret Nicholson, had tried to stab the king, and the addresses of congratulation upon his escape then showed how general was the popular feeling. In 1765 he had an illness lasting two months, in which his reason was affected. On his recovery at that time there was no rejoicing such as took place when, on 23d April 1789, he went to St Paul's to render thanks for his recovery. The Prince of Wales, who had counted upon becoming regent, openly displayed ill-humour at his father's reception. A proof of public feeling was that a play in which Mrs Siddons took a leading part had to be withdrawn from the stage after one representation, because it bore the obnoxious name of 'The Regent.' The marriage of this son to Princess Caroline of Brunswick gave the king much gratification. It took place on 8th April 1794. Three years later the Princess Royal became the wife of the hereditary Prince of Würtemberg. The king's second son, the Duke of York, had married the eldest daughter of Frederick II. of Prussia in 1791. George III. had a large family; it numbered nine sons and six daughters, the first child, the Prince of Wales, being born in 1762, and the last, the Princess Amelia, in 1783. The king had no fear of his children acting like his brother, the Duke of Cumberland, when he married Mrs Horton, or like the Duke of Gloucester, when he married the Countess of Waldegrave. The Royal Marriage Act, which was passed at his instance in 1772, forbade the members of the royal family marrying without the consent of the sovereign, if under twenty-five, or doing so after that age unless a twelvemonth's notice had been given to the Privy-council, and parliament had not expressed disapprobation within that period.

Though George III. was averse to war, he was strongly in favour of restoring the Bourbons to the throne of France. When the union between Ireland and Great Britain was proposed he wrote to Pitt characterising it as one of the most useful measures of his reign; but when the union was effected, and Pitt proposed carrying out his pledges with regard to the emancipation of the Roman Catholics and the endowment of the Roman Catholic priests, the king refused his assent, saying, as Lord Eldon records, 'I can give up my crown and retire from power; I can quit my palace and live in a cottage; I can lay my head on a block and lose my life; but I can *not* break my coronation oath.' Pitt resigned; George III. refused his advice to form a strong administration, including Fox. The king's hatred of Fox amounted to mania; he wrongfully attributed the bad conduct of the Prince of Wales to association with the great Whig leader. Hence the king entrusted Addington with the task of forming an administration, which held office till war with France was renewed, and the necessity for a firmer hand at the helm was apparent. Pitt resumed the office of premier, and died in 1806. A ministry was formed on 5th March 1806, in which Fox and Sidmouth held office, and of which Lord Grenville was the head; it was reconstituted after Fox's death on 13th September in that year, and it was succeeded in 1807 by one of which the Duke of Portland was the head, and in which Perceval was Chancellor of the

Exchequer, and Canning a secretary of state. In 1809 Perceval succeeded to the premiership, and this was the last administration in forming which George III. had any share. His jubilee was celebrated amid popular rejoicings on the 25th October 1809. In 1810 Princess Amelia, his youngest and favourite child, became dangerously ill; the unlikelihood of her recovery preyed upon him and hastened an attack of mental derangement, which incapacitated him for reigning. He had suffered from this malady more than once since 1789. In 1810 the Prince of Wales was appointed regent. Till his death, on 29th January 1820, at Windsor Castle (he was the first English king who died there), George III. was hopelessly insane. He lost his sight as well as his senses.

Though not a drop of English blood ran in his veins, yet George III. was a typical Englishman. He was well-meaning and intensely patriotic; he was truly pious and a pattern of the domestic virtues. His reign was marked by many vicissitudes, and it extended over sixty years. Decisive battles in America, India, and Europe were fought during its course, and many grand conquests were achieved. Great statesmen, such as Chatham, Pitt, and Fox, adorned it; great captains, such as Nelson and Wellington, made their names immortal; the greatest names in modern English literature then rose above the horizon; parliamentary oratory was at its zenith, and nothing was wanting to render the reign the most glorious in the country's annals but greater discretion on the part of the king. If George III. had been a little less of the typical Englishman, he might have been a more admirable sovereign. It was chiefly owing to his prejudices being respected by those who ought to have opposed them that war took the place of conciliation in America, and that war was prosecuted against France, when the interests of the country demanded neutrality among the contending powers on the Continent. When George III. ascended the throne the national debt, in round numbers, was £138,000,000 sterling; before his death it was upwards of £800,000,000. On the other hand, the trade and commerce of the country made gigantic strides during his reign. At his accession the exports did not exceed £12,000,000 sterling; at his death they were upwards of £50,000,000. The imports between that period rose from £8,000,000 to £36,000,000 sterling. At the beginning of the last forty years of his reign the number of newspapers in the three kingdoms was 61; at his death the number was 222. Several years before he died the *Times* newspaper was printed by steam, and the foundations of the daily press as it now exists were laid in the reign of a sovereign who was no favourer of newspapers. The greatest of his misfortunes was to be the father of the eldest son who succeeded him, and it is when George IV. is considered that the merits of George III. become the more conspicuous, and that 'Farmer George,' as he was familiarly called during his lifetime, appears a nobler figure in history than the 'First Gentleman in Europe,' as his eldest son was styled.

See the histories of England by Stanhope, Massey, Martineau, and Lecky; the *Memoirs and Letters of H. Walpole*; the *Grenville Papers*, the Chatham, Rockingham, Bedford, Auckland, and Malmesbury Correspondence; the *Letters of George III. to Lord North*, Burke's Works; the *Letters of Junius*; the *Annual Register*; and *The Opposition under George III.*, by Fraser Rae.

George IV., the eldest son of George III., was born in St James's Palace on 12th August 1762. He became Prince Regent in December 1810, after both houses of parliament had passed resolutions to the effect that the king was mentally incapacitated for discharging the duties of his office. He ascended the throne of the United Kingdom of Great Britain and Ireland after his father's death on 29th January 1820. Till the age of nineteen the prince was kept under strict discipline, against which he sometimes rebelled. When he was fourteen one of his tutors resigned on the ground of 'the ungovernable temper of his charge.' The Bishop of Lichfield, who then became his preceptor, gave the following forecast of the Prince of Wales: 'He will be either the most polished gentleman or the most accomplished blackguard in Europe; possibly an admixture of both.' At the age of eighteen the prince had an intrigue with Mrs Robinson, an actress, who obtained from him a bond for £20,000, and letters which she threatened to make public; she surrendered the letters for £5000, and the bond in return for an annuity of £400. When twenty he went through the ceremony of marriage with Mrs Fitzherbert (q.v.), a Roman Catholic, and by so doing forfeited his title to the crown. When the matter was mooted in the House of Commons, he desired Fox to deny there had been a marriage, and then he found fault with Fox for making the statement. Late in life he said to Lady Spencer, when consulting her about a governess for his daughter, 'Above all, I must teach her to tell the truth. You know that I don't speak the truth, and my brothers don't, and I find it a great defect from which I would have my daughter free. We have been brought up badly, the queen having taught us to equivocate.' The prince led a wild life. Out of antagonism to his father he affected to be a Whig, and associated with the leading members of the Opposition. When a lad he annoyed his father by shouting in his presence, 'Wilkes and Number 45 for ever!' When writing about his eldest son to Lord North, the king styled him an 'ill-advised young man,' and much of the king's aversion to Fox, Burke, and Sheridan was due to their associating with and advising the Prince of Wales. In 1795 he married Princess Caroline (q.v.) of Brunswick, being induced to do so by parliament agreeing to pay his debts, which amounted to £650,000. The prince had shown himself an undutiful son; he now showed himself to be a bad husband; and his conduct to his daughter and only child, the Princess Charlotte (q.v.), was that of a callous father. After becoming king he endeavoured to get a divorce from his wife, who was not more guilty than himself of conjugal crimes; but her death on 7th August 1821 terminated a struggle which had become a public scandal, and in which the people sympathised with the queen. Nothing in the reign of George IV. was more remarkable than his coronation, which was celebrated with as great pomp as that of any previous monarch, and with far greater splendour than that of William IV. or Queen Victoria. It took place on 19th July 1821, and it was described in the *Edinburgh Weekly Journal* by one who signed himself 'An Eye-witness,' and who was Sir Walter Scott. Eleven days after his coronation the king left London for Ireland, while his queen lay on her deathbed. In the *Irish Avater*, Byron writes of 'George the triumphant' speeding 'to the long-cherished isle which he loved like his—bride.' In October of the same year he went to Hanover, and was crowned king. He stopped at Brussels on the way and visited Waterloo, the Duke of Wellington acting as his guide. In August 1822 he went to Edinburgh by water, where he had a magnificent reception, of which Sir Walter Scott was the organiser. The last king who had visited Scotland before him was Charles II. Though a professed Whig when Prince of Wales, George IV. governed as his father had done by the aid of the Tories. Spencer Perceval, Lord Liverpool, Canning, Viscount Goderich, and the Duke of Wellington successively held office

as premiers while he was regent and king. The movement for reform which began in the reign of George III. was opposed, with the king's concurrence, by the advisers of George IV., the massacre at Peterloo, where the inhabitants of Manchester held a reform meeting on 20th August 1820, being the most regrettable of many sad incidents. On this occasion the open-air meeting was charged by cavalry and yeomanry, with the result that eleven persons were killed and about six hundred wounded. On the ground of his religious convictions, George IV. followed his father in opposing the emancipation of the Roman Catholics; but in 1829, when the Duke of Wellington declared that the measure was imperative, the king withdrew his opposition and the measure became law. His failings and vices were conspicuous; it cannot be said that they were wholly redeemed by his taste for music, by having a good voice for singing, and by playing fairly on the flute. It was creditable to him that he read and admired the immortal romances of Jane Austen and Sir Walter Scott. Yet he did not adorn the throne, and when he died on 26th January 1830, he was least regretted by those who knew him best. See Justin M'Carthy, *A History of the Four Georges*, 4 vols. 1889 *et seqq.*).

George V., of Hanover. See HANOVER.

George ('the Bearded'), Duke of Saxony (q.v.).

George, HENRY, was born in Philadelphia, September 2, 1839, went to sea at an early age, and in 1858 arrived in California, [illegible] where he became a journeyman [illegible] printer and married. After a number of years spent at the case, he rose to the editorial desk, conducted several papers, and took an active part in the discussion of public questions. In 1870 he published *Our Land and Land Policy*, a pamphlet outlining the views which have since made him widely known, but which had only a local circulation. In October 1879 appeared *Progress and Poverty* in California. In January 1880 it was published in New York, and in 1881 in London and Berlin. It has since gone through many editions, been translated into the principal languages, and had a circulation without precedent in economic literature. *Progress and Poverty* is an inquiry into the cause of industrial depressions, and of the increase of want with increase of wealth, in the course of which some of the most important of the hitherto accepted doctrines of political economy are recast. Denying the dictum that wages are limited by capital, he argues that wages are produced by the labour for which they are paid; and, denying the Malthusian theory, he contends that increase of population instead of causing want should tend to greater plenty. Then, by an examination of the laws of distribution, in which the laws of wages and interest are shown to correlate with the hitherto accepted law of rent, he comes to the conclusion that, as produce equals rent plus wages plus interest, therefore produce, minus rent, equals wages plus interest. The increase of economic rent or land values explains why the increase of productive power so marked in modern civilisation does not commensurately increase wages and interest. To the tendency of the steady increase in land values to beget speculation in land, which prevents the application of labour and capital, he traces the recurring seasons of industrial depression. The remedy he proposes is the appropriation of economic rent to public uses by a tax levied on the value of land exclusive of improvements, and the abolition of all taxes which fall upon industry and thrift. Meeting objections which may be urged against this proposition on the ground of justice and public policy, he finally brings it to a larger test in an examination of the law of human progress, which he declares to be that of association in equality. Other works are *The Irish Land Question* (1881), *Social Problems* (1882), *Protection and Free Trade* (1886), *A Perplexed Philosopher* (against Herbert Spencer's views on land, 1893). He visited Great Britain and Ireland in 1881, 1883, 1884, 1888, and 1889, and Australia in 1890. In 1886 he ran for the post of mayor of New York as an independent candidate nominated by the working-men. In 1887 he established the *Standard*, a weekly paper in New York. He died suddenly on the 29th October 1897, in the midst of a second candidature for the mayoralty of New York. His *Principles of Political Economy* was posthumously published. Though sometimes styled socialistic, George's views were for the most part diametrically opposed to state socialism. His aim was to sweep away all interferences with the production and distribution of wealth, and only to resort to state control where competition is impossible—to leave to individuals all that individual energy or thrift accumulates, and to take for the use of the community all that is due to the general growth and improvement.

George, LAKE, called also *Horicon*, a beautiful lake, 32 miles long, near the eastern border of New York state. It forms the head-waters of Lake Champlain, is studded with hundreds of picturesque islands, and its shores contain several favourite summer-resorts, especially the village of Caldwell or Lake George. Here was fought the battle of Lake George, in which the French and Algonquins under Baron Dieskau were utterly defeated by the English and Iroquois under Sir William Johnson, on 8th September 1755.

George, THE. See GARTER, ORDER OF THE.

Georgetown, a port of entry in the District of Columbia, is now, as practically a part of Washington, usually called West Washington. It is situated (partly on several eminences) on the Potomac, at the head of navigation. The heights are occupied by elegant villas, and command a fine view of the country around. Here the Chesapeake and Ohio Canal is carried across the Potomac by means of a great viaduct 1446 feet long. The city contains a number of educational institutions, including a Roman Catholic college (1789); and its many flour-mills enjoy a wide reputation. For its administration, see DISTRICT OF COLUMBIA. Pop. (1880) 12,578; (1890) 14,046.

Georgetown (formerly the Dutch *Stabroek*), capital of British Guiana, is situated on the right bank of the Demerara River, not far from its mouth. It is handsomely built, and consists of wide, clean streets, intersecting at right angles; the brightly painted wooden houses, with their Swiss eaves developed into handsome verandahs, are generally raised on piles a few feet above the unhealthy soil, and embosomed in trees, of which the cabbage-palm and cocoa-nut are the chief. Some of the streets, with their long colonnades of palms, are traversed by wide trenches or canals, with bridges at the cross streets. The principal public edifices are the government building, the cathedral, the Queen's College, and a museum and library. There are botanical gardens, several hospitals, an icehouse, and two markets. Water for ordinary purposes is supplied from a canal, the mains being laid through most of the principal streets; and artesian wells, besides tanks for the storage of rain, have to some extent supplied the lack of drinking-water. There is a short railway to Mahaica, and a telephone exchange has been established in connection with the government telegraph system. There is a good harbour, with a lighthouse, and defences erected within recent

years; the foreign trade is virtually that of the colony (see GUIANA, BRITISH). Pop. (1891) 53,176, including many coolies and scarcely 5000 whites. See also GAMBIA, PENANG.

Georgia, the most southerly of the original thirteen states which composed the American confederation, is bounded N. by Tennessee, North Carolina, and South Carolina; E. by the Savannah River, which separates it from South Carolina, and by the Atlantic Ocean; S. by the St Mary River and Florida; and W. by the Chattahoochee River and Alabama. It lies between 30° 31′ 39″ and 35° N. lat., and in 81° —85° 53′ 38″ W. long., and has a maximum length and breadth of 320 and 256 miles, and an area of 59,475 sq. m.—a little more than the area of England and Wales. Upon the Atlantic Ocean it fronts for a distance of 128 miles; but the coast, low-lying and sandy, is bordered with islands, between which and the mainland are a number of sounds and creeks; so that the total coast-line is said to be about 480 miles.

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The territory of Georgia presents five physical divisions: (1) The Sea Islands, famous for their cotton (see COTTON), and covered with a growth of oak, palmetto, magnolia, cedar, pine, and myrtle; (2) the Swamp Region, consisting of rich alluvial lands and deltas, formed by the fresh-water rivers, verdant with a dense and semi-tropical vegetation, and admirably adapted to the production of rice; (3) the Pine Barrens, with a thin soil, lying between these marsh grounds and the undulating red-clay lands of the interior, sheltered by vast forests of pitch-pine, which are highly prized as lumber and for naval purposes, but lonely and monotonous; (4) Middle Georgia, fertile, salubrious, hilly, crowned with forests of oak and hickory, the home of the short-staple cotton-plant, a fine fruit region, and yielding Indian corn, oats, wheat, and other cereals; and lastly (5) Cherokee Georgia, abounding in mountains, with fertile valleys, streams, and waterfalls. Cereals, grasses, and cotton are profitably grown among the valleys and upon the hillsides of Upper Georgia; and increasing attention is being bestowed upon the breeding of stock. In the central area of the last-mentioned division occurs the watershed, giving direction to the streams which flow respectively into the Gulf of Mexico on the one hand, and into the Atlantic Ocean on the other. The entire state is well watered. Of the rivers emptying into the Atlantic Ocean the most noteworthy are the Savannah, navigable as far as Augusta; the Great Ogeechee; the Altamaha, through its tributaries the Oconee and the Ocmulgee navigable as high as Milledgeville and Macon; the Satilla; and the St Mary. The streams belonging to the Gulf system are the upper waters of the Coosa; the Chattahoochee, navigable as far as Columbus; the Flint, navigable up to Albany; and the Alapaha.

With the exception of the swamp-region in the south and south-east of the state, the climate is salubrious and agreeable. The mean temperature is 78° in summer and 47° in winter; the annual rainfall nearly 50 inches. In the lowlands oranges and other semi-tropical fruits readily mature, whilst in the uplands peaches, apples, pears, &c. flourish; and fruits and market vegetables generally, being earlier than in the North, are exported in considerable quantities. The forests contain numerous species of oak, including the evergreen live-oak, which has been styled the king, as the *Magnolia grandiflora* has been styled the queen of the southern woods. Of great value is the long-leaf pine, furnishing both choice timber and naval stores. The list of useful native woods includes also the red, the white, and the post oak, the water-oak, the black walnut, the red cedar, the cypress, the poplar, and the locust. Among the indigenous flora are found valuable medicinal herbs and dye-plants; and the flowers often are of great beauty. Game is still abundant, in spite of the injury resulting from the failure to enact and enforce stringent laws for its preservation. Sea-fowl throng the coast and estuaries, alligators are numerous in the rivers, and food-fishes, oysters, clams, turtle, &c. are abundant. By reason of the denudation of their banks, rendering their waters turbid and causing unruly currents, the fresh-water streams have suffered material diminution in their animal life. From them food-fishes, once so abundant, have largely disappeared, and the pearl-bearing unio is now seldom seen; but the United States Fish Commission has been successful in the introduction of some varieties of fishes better suited to the changed condition.

The mineral wealth of Georgia is apparent in the gold-bearing strata of the Cherokee region, which for the past fifty years have been successfully worked, in extensive deposits of coal, in iron, copper, silver, and lead ores, in marbles of attractive varieties, in vast fields of granite and slate, and in the presence of gypsum, limestone, syenite, marl, buhrstone, soapstone, asbestos, shales, tripoli, fluor-spar, kaolin, clays, porcelain, aragonite, tourmaline, emerald, carnelian, ruby, opal, chalcedony, agate, amethyst, jasper, garnets, rose-quartz, beryl, and occasional diamonds. In 1837–64 the United States branch mint at Dahlonega coined gold bullion to the value of over six million dollars, mostly from metals extracted from the auriferous rocks of the adjacent territory. To the development of these mineral resources of the state much attention is being paid, and with profitable results. Prior to the civil war the inhabitants of Georgia were almost exclusively engaged in agriculture and commerce; but more recent industries are the lumber trade, and extensive cotton, woollen, and other manufactures. The most important mills are at Augusta, Columbus, Atlanta, Athens, and Roswell. Recent statistics show that there are now within the state 54 cotton and woollen mills, with 350,000 spindles and 8000 looms; while the lumber, flour, grist, and pulp mills, &c. are being multiplied, and the iron and steel trade in the north-western part of the state is overtaking the cotton manufacture in importance.

Although, since the civil war, the production of black-seed cotton on the sea islands and along the coast has materially diminished, the yield of short-staple cotton has greatly increased. The average crop of this variety will now approximate 1,000,000 bales, worth at the point of consumption or of export over $40,000,000. Of the other yearly agricultural products of Georgia the rice crop (25,000,000 pounds), the Indian corn (25,000,000 bushels), wheat, oats, sweet potatoes, and tobacco are important; and there is a yearly yield of 600,000 gallons of syrup, 650 hogsheads of cane-sugar, 5,000,000 pounds of butter, and 700,000 pounds of honey. From the ports of Savannah, Darien, Brunswick, and St Mary shipments of lumber and naval stores are annually increasing. Navigable rivers and an admirable system of railways (over 3000 miles), besides three short canals, furnish convenient transportation from the interior. Notably at Savannah, coastwise and foreign bound steamers and sailing-vessels convey the products of the region to the desirable markets of the world.

The state is divided into 137 counties, 10 congressional districts, 1 supreme judicial district, 21 judicial circuits, and numerous militia districts. Atlanta is the capital, and Savannah the commercial

metropolis. Augusta, Macon, Columbus, and Athens may be mentioned among the thriving cities and towns of this commonwealth. The population has steadily increased from 82,548 in 1790 to (1860) 1,057,286; (1870) 1,184,109; (1880) 1,542,180; and at the census of 1890 to 1,837,353, of whom the whites form slightly more than half.

There exists in Georgia a thorough system of free common schools; separate schools are conducted for both white and coloured pupils. Opportunities for higher education are afforded by the university of Georgia, at Athens, by its dependent colleges at Dahlonega, Milledgeville, Thomasville, Cuthbert, and Atlanta, and by sundry denominational colleges. At the university of Georgia and its dependent colleges tuition for Georgians is free. Georgia has also a school for the blind at Macon, for the education of the deaf and dumb at Cave Spring, and an asylum for lunatics near Milledgeville.

History.—The colony of Georgia was founded by James Oglethorpe (q.v.) in 1733, as a refuge for poor debtors and for the persecuted Protestants of Germany, and received its name in honour of George II. In 1752 Oglethorpe surrendered his charter to the British government. Georgia was thereafter classed as an English province, until, with her sister colonies, she succeeded in casting off her allegiance to the crown. Save during the few years of the civil war, she has since continued a component member of the confederation of the United States of America, and has long been regarded as the Empire State of the South. Despite the liberation of her slave population, which in 1860 numbered 450,033, and was valued at $302,694,855, and in the face of grievous losses occasioned by the war, the state has during the last quarter of a century manifested recuperative powers of a marvellous sort.

Georgia, the name formerly applied to the central portion of what is now Russian Transcaucasia (q.v.), bounded by the Caucasian mountains on the north and by the Armenian mountains on the south. The Russian name is Gruzia; the Persian Gurjestan, from which form the name Georgia probably arose, it being perhaps a corruption of Guria, the name of one of the western provinces. The early history of the Georgians, who pretend to trace their origin to Thargamos, a great-grandson of Japhet, is wrapped in fable. Mtskhethos, who is said to have built Mtsketha, the ancient capital of the country, situated near Tiflis, but now reduced to a mere village, plays a prominent part in it. We have also to deal with legend in the story of the Argonauts and Medea, who is said to have been born at Kutais. The Georgians first appear in authentic history in the time of Alexander the Great, to whom they submitted. After the death of Alexander in 323 B.C. they gained their independence under Pharnavas (302–237 B.C.). With Pharnavas begins the series of the kings (a title rendered in Georgian by the word *mephe*), who, under various dynasties, ruled the country almost uninterruptedly for more than 2000 years. In 265 A.D. the Sassanian dynasty ascended the throne in the person of King Marian, and ended with Bakour III. in 570. Towards the close of the 4th century Christianity was introduced by the preaching of St Nina, and in 469 Vakhtang built the city of Tiflis (Tbilisi), so called from the hot-springs found there. Soon after the death of Mohammed his followers entered the country and forced many of the inhabitants to embrace Islam. The Sassanides were succeeded by the powerful dynasty of the Bagratides, one of whom, Bagrat III. (980-1008), extended his dominions from the Black Sea to the Caspian; but during the eleventh century the Georgians twice suffered from an invasion of the Seljuks, who committed great devastations.

The country reached the height of its glory in the reign of Queen Thamar or Tamara (1184–1212), the daughter of George III. With her marriage to the son of the Russian prince, Andrew Bogoliubski, may be said to begin the connection between Russia and Georgia. The dominions of Tamara were more extensive than those of any other native sovereign, and her court was graced by the presence of many men of letters. But evil days were in store for Georgia. In 1220 and 1222 we hear of Mongolian invasions, and Tiflis was harried with fire and sword. Towards the end of the 14th century the country fell into the hands of Timour, who, however, was driven from it in 1403 by George VII. One of George's successors, Alexander (1413–42), committed the fatal error of dividing the kingdom between his three sons. The general history of Georgia now separates into two parts: that of the eastern states, Karthli and Kakheth, and that of the western states, including Imereth, Mingrelia, and Guria. From the 16th to the 18th century the Georgians suffered grievously from the Persians. In 1618 Shah Abbas invaded the country, and Teimuraz I. applied for help to the Czar Michael; in 1638 Levan, king of Mingrelia, took the oath of allegiance to Alexis; it was only from their co-religionists that the Georgians could hope for succour in their hour of need. They also suffered from the encroachments of the Turks. In 1795 the savage Aga Mohammed Shah invaded Georgia, and levelled Tiflis to the ground, carrying away a great number of captives. The aged king Heraclius II., an able sovereign, seeing that all resistance was in vain, fled to the mountains, where he soon afterwards died. His son, George XIII., resigned the crown in favour of Paul, emperor of Russia, in 1799; but his brother Alexander did not acquiesce in this arrangement, and held out for some time, but was defeated in a battle on the banks of the Ior. George died in 1800, and in the following year Alexander of Russia formally annexed the country. In 1810 the prince of Imereth attempted a revolt, which was quickly suppressed. Guria was finally united with Russia in 1829.

The former kingdom of Georgia is mainly included in the governments of Kutais, Tiflis, and Elizabethpol. The district is very fertile, being abundantly productive of cereals, wine—especially the Kakhetian—honey, and silk, of cattle and horses, while the mountains teem with mineral wealth, as yet little utilised. The Georgians belong to the Kartveli stock, forming the southern group of Caucasian peoples. Their numbers have been variously estimated. Some fix them at about 911,000, but Von Eickert (*Der Kaukasus und seine Volker*, Leip. 1887) gives the following calculation, as based in the main on the last census of 1881:

Georgians (in the restricted sense of the term)	550,000
Imeretes, Mingrelians, Gurians	480,000
Abchasians and Lazes	200,000
Pshavs, Khevs, Mthiuletians, &c.	70,000
Tushes	6,000
Kistes	7,000
Mingrelians	210,000
Swanetians	13,000
	1,100,000

To this work is appended an excellent ethnological map. The Georgians and their congeners are of the Caucasian or Fair race (as opposed to the Mongolian or Yellow race). They are celebrated for their beauty, and under the Mohammedan rule the white slaves of western Asia and of Egypt were mostly drawn from among them and the Circassians. To the great credit of Russia this

disgraceful traffic was put an end to by the treaty of Kuchuk-Kainardji in 1774. Though endowed by nature with mental no less than physical advantages, the long course of oppression to which they have been subjected has had its effect upon their characters. But, despite the supremacy and brutal tyranny of their Mohammedan conquerors, they have as a nation remained faithful to the Christian religion, according to the doctrines of the Greek Church. In Guria, however, and the country of the Lazes, large numbers of the inhabitants were forced by persecution to embrace Islam, and in these districts the ruins of many churches may still be seen. The southern Caucasians, with magnificent physique, fertile soil, and enervating climate, are somewhat indolent; they are passionately fond of singing and music.

The four chief tongues—Georgian, Mingrelian, Suanetian, and Lazian, which some have called the Iberian group—stand to each other more in the relation of languages than dialects, although they certainly all had a common origin; Mingrelian especially has greatly diverged. Georgian alone of the four has a literature, if we except the few folk-tales of the Mingrelians. These languages are of the agglutinative type; the chief difficulty lies in the verbs, which incorporate the pronominal prefixes and suffixes. In their structure they resemble Basque, but no affinity can be established between these two families of languages, as their vocabularies have no word in common.

The Georgians use two alphabets—the *khutsuri* or ecclesiastical, and the *mkhedruli* or civil: the first is only employed in the religious books. They are very old, and legendary accounts are given of their origin. The ecclesiastical resembles the Armenian alphabet; the civil is a very pretty character, with many rounded letters, which make it somewhat resemble Burmese. Georgian literature is by no means poor. Professor Tsagarelli gives a list of 946 Georgian MSS. known to exist; they are preserved in monasteries at Jerusalem, on Mount Athos and Mount Sinai, and at Tiflis, in the library of the Society for the Diffusion of Education among the Georgians. Besides these, there are 36 MSS in the Bibliothèque Nationale in Paris, and 34 in private hands at Tiflis. Further search will, no doubt, bring to light others. As far as it can be traced back, the literature begins about the 5th century A.D., with translations of the Scriptures and the Fathers, and later on we get versions of the Greek classical authors, including Plato, Aristotle, and Josephus. To the 7th century belongs a fine psalter on papyrus, and there is a complete manuscript of the Bible of the 10th, preserved at Mount Athos. The great literary development, however, of the country was during the 11th and 12th centuries, and especially in the reign of Queen Tamara. To this period belongs the popular epic, 'The Man in the Panther's Skin' (*Vephkhvis-tkaosani*), a poem narrating the love of Avtandil for Tinatina, daughter of the Arabian king Rostevan, and that of Tariel for Nestan Daredjan, daughter of the Indian king Parsadan. It is a richly-coloured work, as if written by an oriental Tasso, and enjoys great popularity among the Georgians at the present day, many of the couplets—it is written in quatrains—having passed into proverbs. The author, Shota Rustaveli, was the glory of the reign of Queen Tamara, and is said to have died at Jerusalem as a monk in 1215. A handsome illustrated edition of this work appeared at Tiflis in 1888. Of Shavtel, another poet of the time who also enjoyed considerable reputation, only a few odes have come down. Chakhrukhadze composed a long and rather tedious poem in honour of the famous queen; prose tales were written by Sarkis of Thmogvi, the most celebrated being the *Visramiani*, and a poem by Mose of Khoni, called *Daredjaniani*. Now that the Georgians have been secured by Russian protection from their Moslem foes, they are busy in studying their old literature and editing their MSS. Somewhere about the same time as these authors flourished was begun the Georgian chronicle, called *Karthlis Tskhovreba*, or life of Georgia, the first part of which is anonymous, and carries the history from the earliest times to the year 1224; a continuation, also anonymous, brings it down to the year 1445.

But this brilliant period was destined to a temporary eclipse; during the 14th and the next two centuries the country was a prey to Mongols, Tartars, Persians, and Turks; the cities were devastated, many of the inhabitants were carried into captivity, and valuable MSS. were lost or destroyed. In the 17th century, however, matters began to mend. Towards the close flourished Saba Sulkhan Orbeliani, one of the most learned men of his time, who visited Paris, where he was well received by Louis XIV., and Rome. To him his countrymen are indebted for the first dictionary of their language, called, in oriental style, 'The Bouquet of Words;' it was edited at Tiflis in 1884. His also was the popular work, 'The Book of Wisdom and Falsehood' (*Tsigni Sibrmnè-sitsruisa*), a collection of amusing fables and apologues, some of his own invention, and others drawn from the stores of Georgian and other oriental folk-tales. A Russian translation of this interesting book has been published by Professor Tsagarelli of St Petersburg.

In 1709 King Vakhtang VI. established a printing-press at Tiflis. One of the works which appeared was 'The Man in the Panther's Skin,' to which he added a curious mystical commentary, giving the book a religious meaning, perhaps to rehabilitate it among the clergy, who regarded it as a profane work. Vakhtang also laboured at a translation of the *Kalilah and Damnah*, in which he was assisted by Sulkhan Orbeliani (edited at Tiflis in 1886). This king, thinking his country lost on account of a fresh invasion of the Turks, emigrated to Russia with many Georgian families, and in consequence of their presence in the country the great Georgian Bible was published at Moscow in 1743. To this century also belong the *Davithiani*, a poem by Guramishvili, and the first Georgian grammar, by the Catholicos (Primate) Anthony, besides other works. Vakhusht, the son of Vakhtang, continued the chronicle of his country till 1745, and wrote a geographical description of it, a work of great value. Since the peaceful settlement of Georgia under the Russians, literature has been greatly developed. The fine lyric poets, Alexander Chavchavadze (whose daughter married Griboiedov, the Russian dramatist), Raphael Eristavi, Nicholas Baratashvili, and Akaki Tsereteli, have appeared. The most conspicuous literary man of Tiflis at the present time is Prince Ilya Chavchavadze, author of some of the most graceful lyrics in the language, and some spirited tales in which he has satirised the luxury and other weaknesses of his countrymen. He is editor of the Georgian literary and political daily journal, *Iberia*. Some of the plays of Shakespeare, among others *Hamlet* and *Othello*, have been translated by Prince Machabeli. Altogether, Georgian literature may be said to be in a flourishing condition.

The pioneer in the study of Georgian history and philology was Brosset, who published *Éléments de la Langue Géorgienne* (Paris, 1837), an elaborate edition of the *Georgian Chronicle* (St Petersburg, 1849-58), and many other works. Chubinov's *Grouzinsko-russko-frantsouskii Slovar*, *Dictionnaire Géorgien-français-russe* (St Petersburg, 1840), and *Russian-Georgian Dictionary*

(1846; new ed. 1886); Prof. A. Tsagarelli's notices of Georgian literature and Georgian studies (in Russian) and documents illustrating Georgian literature (St Petersburg, 1886-90), and A. Leist's *Georgien* (1885) and *Georgische Dichter* (Leip. 1887) may be mentioned. See also French books on Georgia by Langlois and Villeneuve, Wardrop, *The Kingdom of Georgia* (1888), and *Georgian Folk Tales* (1894). For the Church in Georgia, see GREEK CHURCH, Vol. V. p. 400.

Georgia, GULF OF, an arm of the Pacific, between Vancouver's Island and the mainland of British Columbia, communicating with the ocean by Queen Charlotte's Sound in the north, and by the Strait of Juan de Fuca in the south. It is 250 miles long by a little over 30 broad.

Georgian Bay. See HURON (LAKE).

Georgium Sidus. See HERSCHEL, PLANETS.

Georgswalde, a town on the northern border of Bohemia, 112 miles N. of Prague by rail, with a mineral spring and linen manufactures. Pop. 5808.

Gephyrea, a class of unsegmented marine worms, divided into two distinct sub-groups: (*a*) the Gephyreans proper, without bristles (*G. achaeta*—e.g. Sipunculus (q.v.), Priapulus, Phascolosoma; and (*b*) the Echiuroids or armed Gephyreans (*G. chaetifera*)—e.g. Echiurus, Thalassema, Bonellia (q.v.). They live at the bottom of the sea, in sand, mud, or among rocks. While the adults of both sub-groups are not segmented, the larvæ of the Echiuroids are, and on this and other grounds many authorities place them apart from the other Gephyreans and nearer the Annelids.

See Selenka, 'Gephyrea,' *Challenger* Rep. xiii. (1885); De Mace, Bülow, and Selenka, 'Die Sipunculiden,' in Semper's *Reisen im Archipel der Philippinen*, part ii. (1884); Rietsch, 'Monograph of Echiuridæ,' *Recueil Zool. Suisse*, iii. (1886).

Gepidæ, a people of Germanic origin, whom we first read of as settled about the mouth of the Vistula in the 3d century. Before the 5th century they had migrated to the Lower Danube, where they were subjugated by the Huns; but, revolting against Attila's son, they recovered their freedom and established themselves in Dacia. There their power grew so great that they levied tribute from the Byzantine emperors down to Justinian's days. In the end of the 5th century a powerful enemy arose to them in the Ostrogoths; and after them came the Longobards, who, in alliance with the Avars, inflicted a crushing defeat upon the Gepidæ in 566. A part of the last-named then submitted to the Avars, whilst a part accompanied the Longobards to Italy. Henceforward we hear of them no more.

Gera, a town of Germany, capital of the small principality of Reuss-Schleiz, is pleasantly situated on the White Elster, 42 miles E. by S. of Weimar by rail. Nearly destroyed by fire in 1780, it is for the most part a modern town, with broad and regular streets, but its older buildings include a castle and a fine town-hall. There are over a score of extensive woollen factories, besides cotton-works, dyeing and printing works, manufactures of machinery, leather, tobacco, and beer for export, and four publishing houses; and eight establishments, employing 1500 hands, turn out thousands of melodeons, accordions, and jews'-harps yearly. Pop. (1843) 11,300; (1880) 27,118; (1895) 42,300, nearly all Protestants.

Gerace, a town of southern Italy, 4 miles from the sea, and 37 (58 by rail) NE. of Reggio. It has a cathedral, rebuilt after the earthquake of 1783, and a trade in wine, especially the esteemed *Lacrima di Gerace*. There are iron mines and a hot sulphur-spring close by, and on a neighbouring plain are the ruins of the ancient *Locri*. Pop. 5265.

Gerando. See DEGERANDO.

Geraniaceæ, an order of thalamiflоral dicotyledons, herbs or undershrubs of temperate countries, particularly abundant at the Cape, and of which the leading genera Geranium, Pelargonium, and Erodium yield a great number of garden and greenhouse plants (see GERANIUM). In a wider sense the order is extended to include the closely related Lints (Linaceæ) and Sorrels (Oxalidaceæ), together with the curiously specialised Balsaminaceæ, and sometimes also the Tropæolaceæ (see TROPÆOLUM), of which, however, the affinity is more doubtful.

Geranium, the typical genus of Geraniaceæ, which includes about 100 perennial and annual herbs. The popular name (Crane's-bill) is derived from the resemblance to the crane's beak presented by the beak-like process attached to the fruit, this curiously assists in the distribution of the seed by its characteristic mode of splitting spirally into awn-like processes and carrying the seed along with them. Twelve species are natives of the woods, hedgerows, and fields of Britain. Of these several are cultivated in gardens, especially *G. sanguineum*, with its variety *lancastriense*, and the double-flowered form of *G. sylvaticum*, one of the handsomest of border flowers, while among pretty exotic species may be named *G. armenum*, *platypetalum*, &c. Several are of old medicinal

Herb Robert (*Geranium Robertianum*).

repute, notably *G. Robertianum* (Herb Robert or Stinking Crane's-bill), which emits a strong disagreeable odour that is said to banish bugs: it is indigenous in the United States. *G. maculatum* is the Alum Root of North America—a root so powerfully astringent as to be employed, both by the Indians and the European settlers in the United States, in domestic medicine for many disorders requiring the exhibition of astringents. *G. carolinianum* is another American species. A few species produce edible tubers—e.g. *G. tuberosum* of South Europe, and *G. parviflorum*, the Native Carrot of Tasmania. The name Geranium is, however, often popularly misapplied to the members of the allied genus Pelargonium; witness the so-called 'scarlet geranium,' 'ivy-leaved geranium,' &c. See PELARGONIUM.

Gérard, ÉTIENNE MAURICE, COMTE, Marshal of France, was born at Damvilliers, in Lorraine, 4th April 1773. Volunteering into the army in 1791, he associated his fortunes for some years with those of Bernadotte, serving on the Rhine, in Italy, in the Vendée campaign, in Germany, and in Spain, where he especially distinguished himself at Fuentes de Oñoro. For his brilliant services at Austerlitz (1805) he was appointed general of brigade; he also took a notable part at Jena (1806), Erfurt (1806), and Wagram (1809). During the Russian campaign of 1812 he rendered conspicuous service at the capture of Smolensk, in the battle of Valon-

tina-Gora, and at the passage of the Beresina. After Napoleon's return from Elba he commanded a division at Ligny, and was wounded at Wavre. The second restoration compelled him to leave France, and he did not return till 1817. In 1831 he commanded the French army sent to the assistance of the Belgians against the Dutch, whom he drove out of Flanders, and on 27th December 1832 compelled the citadel of Antwerp to capitulate. After the July revolution of 1830 he was appointed marshal and war-minister by Louis-Philippe; he was again war-minister from July to October in 1834. He died at Paris, 17th April 1852.

Gérard, Baron François Pascal, painter, born of French parentage at Rome, 11th March 1770, at ten was brought to France, and at sixteen became the pupil of David. In 1795 he exhibited 'Belisarius,' which first brought him into notice; shortly afterwards he painted 'Psyche receiving the First Kiss from Cupid.' Previous to this he had already begun to work at portrait-painting, his portrait of Madame Bonaparte in 1799 being the beginning of his career as the 'painter of kings.' Almost all the royal and other celebrities who visited Paris between 1799 and 1837 were painted by Gérard, who owed his success not alone to his skill as a portraitist, but also to the charm of his manners and conversation. The grandest of his works are, however, historical pictures, the 'Battle of Austerlitz' (1810) and the 'Entry of Henry IV. into Paris' (1814). Gérard was appointed first court-painter and raised to the rank of baron by Louis XVIII. He died at Paris, 11th January 1837. Gérard's most celebrated portraits are those of Napoleon in his coronation robes, the Queen of Naples and her Children, Talleyrand, Talma, Louis-Philippe, and Madame Récamier. See books by Adam (3 vols. 1852–57) and H. Gérard (1867).

Gerard, John, herbalist, was born at Nantwich, in Cheshire, in 1545. Settling in London, he kept Lord Burghley's gardens for over twenty years, practised as a barber-surgeon, becoming master of the company in 1608, and died in 1612. His famous *Herball* was published in 1597, mainly based upon the *Stirpium Historiæ Pemptades* (1583) by Rembert Dodoens. An enlarged edition of Gerard's *Herball* was issued by Thomas Johnson in 1633.

Gérard, caricaturist. See Grandville.

Gérardmer ('the Queen of the Vosges'), a holiday resort much frequented by Parisians, and famous for its cheese, is in the dep. of Vosges, 32 miles SE. of Épinal by rail. Pop. 7300.

Ger'asa, in the time of the Romans a flourishing city of Palestine, was situated among the mountains of Gilead, about 20 miles east of the Jordan. Parts of the city wall are still in good preservation; two theatres and several temples can be identified; and 230 columns are still standing.

Gerbert. See Sylvester II.

Gerhardt, Karl Friedrich, chemist, born at Strasburg, 21st August 1816, at fifteen was sent to the Polytechnic School of Carlsruhe, and afterwards studied chemistry at Leipzig, and under Liebig at Giessen. In 1838 he arrived in Paris, where he lectured on chemistry, and where with his friend Cahours he commenced his researches on the essential oils. In 1844 he was appointed professor of Chemistry at Montpellier. About this time he published his *Précis de Chimie Organique*, in which he sketches the idea of 'Homologous and Heterologous Series.' In 1845–48, in association with Laurent, he published the *Comptes rendus des Travaux de Chimie*. In 1848 he resigned his chair and returned to Paris in order to follow out uninterruptedly his special investigations; and in that city he established, between the years 1849 and 1855, in successive memoirs, his views of series and the theory of types with which his name is associated in the history of chemistry. It was there, also, that he gave to the scientific world his remarkable researches upon the anhydrous acids and the oxides. In 1855 he became professor of Chemistry at Strasburg. All his ideas and his discoveries are embodied in his *Traité de Chimie Organique* (4 vols. 1853–56). He had hardly completed the correction of the last proof of this great work, when, after an illness of only two days, he died on 19th August 1856. See the Life by his friend Cahours.

Gerhardt, Paul, perhaps the best writer of hymns that the German Lutheran church has produced, was born at Gräfenhainichen, in Saxony, 12th March 1607, became dean at the church of St Nicholas in Berlin in 1657, but, in consequence of his opposition to the elector Frederick-William's attempt to bring about a union of the Lutheran and Reformed churches, was banished from Brandenburg in 1666. The last seven years of his life he was pastor of Lübben, where he died, 6th June 1676. He wrote 123 hymns, all excellent, and many of them worthy to be placed amongst the choicest productions of Protestant sacred poetry. The one beginning 'Commit thou all thy ways' is well known in England from Wesley's translation. Other exquisitely tender lyrics are 'Nun ruhen alle Wälder' (Now all the woods are sleeping), 'O Haupt voll Blut und Wunden' (O wounded head and bleeding), 'Du bist zwar mein, und bleibest mein' (Thou 'rt mine, yes, still thou art mine own).

Géricault, Théodore (1791–1824), military painter and lithographer, was, with Delacroix, one of the first Romanticists (see Painting, Vol. VII. p. 700). He was born at Rouen, studied under Vernet and Guerin, began to exhibit in the Salon in 1812 (with the 'Mounted Chasseur of the Imperial Guard'), worked for a year or two in Italy after 1816, and died at Paris. His favourite subjects were soldiers (especially cavalry) and horses, but his 'Raft of the Medusa' became the manifesto of the naturalist-romantic movement.

Gerizim and Ebal, the two highest mountains in the central Palestine chain (3000 feet), separated from each other by a deep narrow valley, in which stands the town of Nâblus (q.v.). The valley between them is very fertile. Jacob's well stands where the vale joins the plain of Moreh. On the slope of Ebal to the north of the well is Sychar (now 'Askar). Mount Gerizim, along with Mount Ebal, was the scene of a grand and impressive ceremony, in which the whole people of Israel took part after crossing the Jordan, in obedience to a command which Moses had given them (Deut. xxvii.). The half of the tribes standing on Gerizim responded to and affirmed the blessings, those on Ebal the curses as pronounced by the Levites. The Samaritans built a temple on Mount Gerizim as a rival to that of Jerusalem, and organised a rival priesthood; and the Samaritan Pentateuch closed the Decalogue with the injunction, 'Thou shalt build a temple on Mount Gerizim, and there only shalt thou worship.' And, though the Samaritan temple was destroyed by Hyrcanus about 200 years after, the mountain on which it stood continued to be held sacred by the Samaritans. It was to Mount Gerizim that the 'woman of Samaria' referred when she said to our Saviour: 'Our fathers worshipped in *this* mountain, and ye say that in Jerusalem is the place where men ought to worship.' Subsequently, a Christian church in honour of the Virgin was built on it.

Germ, a name applied to the egg-cell of plant or animal, either from the first or in its early

stages; but also used in reference to micro-organisms associated with disease (see BACTERIA, &c.). By 'germ-cells' the reproductive elements, especially the ova, are meant; while 'germ-plasma' is a very common modern word for the most essential parts of the nuclei in the reproductive cells. See EMBRYOLOGY, HEREDITY.

GERM THEORY OF DISEASE, as the name implies, seeks to find the explanation of certain well-recognised conditions of disease in the presence and action of specific living organisms within the affected body. Though comparatively recently introduced as an efficient working hypothesis in the investigation of some hitherto ill-understood pathological phenomena, the correctness of the theory is now generally admitted. The facts which it has aided in establishing and the numberless investigations which it has inspired have created an important department of medical science. The study of bacteriology (see BACTERIA) has awakened fresh interest in almost every branch of medicine; and the subject possesses a large and extensive literature of its own.

The evolution of the theory was due mainly to two factors: (1) The discussions and investigations which circled round the process of fermentation; (2) the application of more perfect microscopical methods to the study of the lowest forms of plant and animal life.

(1) The familiar process of Fermentation (q.v.) gave birth to much debate. The earlier chemists (Gay-Lussac, and more recently Liebig) held that fermentation was merely the result of the process of decay of organic matter. Various modifications of this doctrine, which cannot be considered here, were enunciated, but the general conclusion remained the same. On the other hand, so early as 1812, Appert had demonstrated from the practical side that organic substances capable of fermentation or putrefaction could be preserved intact if kept in closely stoppered bottles which were afterwards exposed to the temperature of boiling water. In 1836 Cagniard-Latour described an organism, the yeast plant, which he affirmed to be constantly present in the fermenting fluid. Its growth and reproduction he believed to proceed synchronously with the fermentation. Schwann (1837) described this organism independently, and Helmholtz (1843) confirmed the observation. They maintained that the process, in place of being a mere decomposition, was vital and depended on the presence of the organism they had discovered. This revolutionary doctrine was further elaborated pre-eminently by Pasteur and by Schultz, Schroeder, Dusch, Lister, Tyndall, and others. Their researches showed that fermentation was caused by the presence of these organisms; that the exclusion of these from fluids capable of fermentation, by various methods of sterilisation and filtration of the air in which they were abundantly present, was sufficient to prevent its occurrence; that the doctrine which attributed the production of fermentation to the influence of certain gases—e.g. oxygen (Gay-Lussac)—was erroneous; that the idea of the spontaneous generation (see SPONTANEOUS GENERATION) of such organisms within properly sterilised and protected fluids (Needham, Bastian, Pouchet, Huizinga) was fallacious; and that the so-called putrefaction was but one variety of fermentation.

(2) One result of these discussions was to develop a refinement of the methods of microscopical research, more especially with reference to the investigation of the lowest forms of life (see BACTERIA). Though bacteria had been recognised and described in the 17th century (Leeuwenhoek), it is mainly to the researches of the latter half of the 19th century that we are indebted for an approach to an accurate knowledge of the life-history of these organisms. By the masterly labours of Cohn, De Bary, Zopf, Van Tieghem, Nägeli, Klebs, Koch, and many others, the methods of demonstration have been improved to an extraordinary degree. The elaboration of staining methods alone, in conjunction with the use of perfected lenses, has made possible the detection and examination of minute organisms hitherto unrecognisable.

It is impossible to say when the idea of an analogy between the familiar phenomena of fermentation and those of acute disease first arose. It is certain that before the 19th century there had been prevalent an ill-defined feeling after something of the kind. More than two hundred years ago Robert Boyle (1627–91), in his 'Essay on the Pathological Part of Physik,' clothes the idea in words which, as Tyndall has said, 'have in them the forecast of prophecy.' The idea received more definite formulation in consequence of the researches into the nature of fermentation just referred to. In 1848 Fuchs stated that he had discovered bacteria in animals which had died of septicæmia. In 1850 it was announced (Davaine, Branell, Pollender) that bacilli had been detected in the carcasses of animals affected with anthrax. The discovery was corroborated by various observers. But it was not till the disease had been induced by the inoculation of healthy animals with a minimal quantity of the organism (Davaine) that the *Bacillus anthracis* was recognised as the cause of the disease. Thus was afforded the first substantial proof of the germ theory. This success inspired further research on kindred lines. In comparatively quick succession other discoveries were announced, till, in 1882, Koch described the *Bacillus tuberculosis* as the organism responsible for the scourge of consumption, and in 1883 the bacillus of cholera.

Emphasis must be laid on the statement that the discovery of an organism in the circulation or tissues of a diseased animal cannot be accepted as proving the causal efficacy of the former. Apart from further experiment, it were perfectly fair to argue that such organism was a mere accompaniment of the morbid state, flourishing on the dying or diseased tissues. And, in fact, such secondary factors are recognised. It has, moreover, frequently happened that competing claims have been advanced in explanation of the same disease. It was necessary, therefore, that there should be formulated (Klebs, Koch) certain conditions, since known as Koch's postulates, which must be fulfilled by an organism whose causal relationship with a given disease is maintained. These are as follows: (1) The organism must be demonstrated in the circulation or tissues of the diseased animal; (2) the organism, so demonstrated, must be capable of artificial cultivation in suitable media outside the body, and successive generations of *pure cultivation* obtained; (3) such pure cultivation must, when introduced into a healthy and susceptible animal, produce the given disease; (4) the organism must again be found in the circulation or tissues of the inoculated animal. The claims of organisms which fail to meet these demands must be set aside to await further proof.

The number of diseases whose specific origin is now generally admitted is comparatively large, but of few of these can we speak with the same certainty as may be done regarding consumption (tuberculosis) and splenic fever (anthrax). In other words, the fulfilment of all four postulates by many of them has not been demonstrated or has been disputed. Besides anthrax and tuberculosis, the list includes leprosy, cholera (Asiatic), relapsing fever, typhoid fever, yellow fever, malaria, diphtheria, dysentery, syphilis, acute pneumonia,

gonorrhea, septicæmia, erysipelas, actinomycosis, &c. With considerable probability we may add whooping-cough, measles, scarlatina, typhus, small-pox, hydrophobia, tetanus, British cholera, &c.; but the evidence regarding these and others is defective, and, in some cases, less substantive than analogical.

The specific organisms associated more or less exactly with those diseases are members of the groups (*a*) Coccaceæ and (*b*) Bacteriaceæ (see BACTERIA).

The admission that certain diseases are due to the presence and action of specific living organisms raises the further questions: (1) How do they enter the body? (2) How do they act?

(1) How do they enter the body? It has been conclusively shown that the *Bacillus tuberculosis* may obtain access by the inhalation of germ-laden air, by the ingestion of affected milk and possibly of tubercular meat, perhaps, too, through a cut or sore. It seems also likely that the bacilli may be transmitted from mother to fœtus by way of the circulation. Similar lines of attack may be predicated of all the pathogenic organisms. Notably, in connection with wounds, it is important to bear in mind the possibility of infection with the germs which induce septicæmia—a fact on which was based the great advance in surgery associated with the name of Lister. See ANTISEPTIC SURGERY.

The possibility of infection varies much according to the conditions of growth of the particular organism and the receptivity of the host. This explains, on the one hand, the popularly accepted view that certain diseases are much more infective than others. Thus, typhoid fever differs widely from scarlatina in respect of degree of contagiousness. On the other hand, some persons undoubtedly are more susceptible to the attacks of certain organisms. Thus, among the subjects of tuberculosis, it is probable that preparedness of soil plays an important part in the production of the disease. And so with other pathogenic organisms. These processes have their analogy in the more common phenomena of vegetable life. Sow some seeds and they will germinate and grow on any soil, however unlikely. Other seeds may be scattered profusely, but will not develop, unless the soil has been carefully prepared and the other conditions of growth be fulfilled. It is impossible to enter here on the discussion of those conditions. Necessarily they vary much with different organisms. But it is important to realise the extreme value, from the therapeutic point of view, of their careful study. The first step to a rational treatment of such diseases is to *know* the responsible organism. This knowledge must include not only its shape and other physical characters, but the life-history of the microbe, and the conditions which assist or retard its development and reproduction. Such knowledge affords the only sound basis for a system of *preventive* medicine, which constitutes one of the most important departments of practical hygiene. Although still in its infancy, the preventive treatment of endemic, epidemic, and other contagious diseases has now become scientific.

(2) How do the organisms act? This is a much-debated question. It has been the subject of some of the most valuable of recent researches in this department. Do they act mechanically as irritants? Or is their action privative, by stealing from the tissues elements which are necessary to their development? Or have they a power of elaborating (or secreting) new products, which exert a toxic influence on the affected body? This last view is supported by weighty evidence and by the analogy of the fermentation processes already referred to. It would therefore seem that the microbe has the power of disturbing—or rather that, in order to the preservation of its own life, the microbe is compelled to disturb—the molecular arrangement of the elements in the medium in which it is developing. The products thus elaborated have been termed Ptomaines (*Ptōma*). They were so named by Selmi, who discovered their presence in the dead body during various stages of putrefaction. The ptomaine doctrine has been accepted in explanation of the process of septicæmia, and there is good reason for extending its application to the other infective processes. It is essential, however, to remember that, after the microbe has succeeded in invading the tissues, its further progress is not unopposed. There is a constant warfare between the living cells of the host and the living and multiplying cells of the invader, the contest being decided in favour of the stronger. The researches of Metschnikoff and others seem to show that the bacilli can be destroyed by the white corpuscles of the blood.

Granted that the organisms have entered the tissues or circulation, there still remain for the physician two modes of attack: (*a*) by attempting to exterminate the microbe itself through such agents as may be discovered to be possessed of germicidal properties; (*b*) by endeavouring to antagonise the poison which the microbe is distributing through the system. Many difficulties attend both methods, inasmuch as agents sufficiently potent to effect either object are themselves likely to prove injurious to the infected tissues. The aim of *curative* medicine is the discovery of remedies capable of preventing the growth of the microbe, yet innocuous to the host.

Reference must be made, in conclusion, to the question of immunity. It is well ascertained that certain animals are not susceptible to the attacks of certain pathogenic organisms, and that others suffer comparatively slightly. In man there may be traced the occurrence of individual immunity. Such facts have not yet received a satisfactory explanation. The almost universal immunity after a first attack of certain fevers and the comparative immunity from smallpox conferred by Vaccination (q.v.) are of interest in this connection. The experiments of Pasteur and others on *Bacillus anthracis* indicate that by repeated cultivation under special conditions it is possible to lessen the virulence of the most virulent of organisms and that inoculation with this altered bacillus confers immunity against further attack. More striking still are the experiments of Pasteur in connection with rabies (Hydrophobia, q.v.). By a special method that observer has accomplished an attenuation of the virus—the microbe not having been determined—whereby the worst features of the disease are disturbed. By this means it has been found possible in cases of infection to anticipate a serious attack by the introduction of this modified virus. In explanation of this it has been supposed that a poisonous ptomaine is germinated during the process, which, when injected in quantity during the stage of incubation of the disease, prevents the development of the supposititious germ. Those and other kindred observations disclose a most hopeful development of the germ theory in the direction of preventive inoculation.

The literature is a very large one. For general purposes the following may be consulted: Tyndall, *Essays on the Floating Matter of the Air*; Watson Cheyne, *Antiseptic Surgery*; Pasteur, *Studies on Fermentation*; Duclaux, *Ferments et Maladies*; Flugge, *Fermente und Mikroparasiten*; Schützenberger, *Les Fermentations*; Gussenbauer, *Pyo-hæmie und Pyo-Sephthæmie*; and the works of Lister, Klein, &c.

German Barm. See YEAST.

German Catholics (Ger. *Deutschkatholiken*) is the name given to a body in Germany that

separated from the Roman Catholic Church in 1844. Whatever might be the deeper causes of the schism, the immediate occasion of it was the exhibition of the Holy Coat at Treves (q.v.). In 1844 Bishop Arnoldi appointed a special pilgrimage to this relic. This proceeding called forth a protest from Johannes Ronge (1813–87), a priest in Silesia, who, having quarrelled with the authorities of his church, had been suspended. Ronge addressed a public letter to Bishop Arnoldi in which he characterised the exhibition of the coat as idolatry. A short time previously, Czerski, a priest at Schneidemuhl, in Posen, had seceded from the Roman Catholic Church, and had formed a congregation of 'Christian Apostolic Catholics.' Czerski and Ronge were naturally drawn into confederacy. Ronge addressed an appeal to the lower orders of the priesthood, calling upon them to use their influence in the pulpit and everywhere to break the power of the papal curia, and of priestcraft in general, throughout Germany; to set up a national German Church independent of Rome, and governed by councils and synods; to abolish auricular confession, the Latin mass, and the celibacy of the priests; and to aim at liberty of conscience for all Christians.

The first congregation of the new church was formed at Schneidemühl, and took the name of 'Christian Catholic.' The confession of faith, which was drawn up by Czerski, differed little in point of doctrine from that of the Catholic Church. The confession drawn up by Ronge for the congregation at Breslau, on the other hand, completely departed from the doctrine and ritual of the Roman Catholic Church. The Scripture was laid down to be the sole rule of Christian faith, and no external authority was to be allowed to interfere with the free interpretation of it. The essentials of belief were restricted to a few doctrines: belief in God as the Creator and Governor of the world, and the Father of all men; in Christ as the Saviour, in the Holy Spirit, the holy Christian church, the forgiveness of sins, and the life everlasting. Baptism and the Lord's Supper were held to be the only sacraments, though confirmation was retained. At the first council of German Catholics, held at Leipzig in 1845, the principles of the Breslau Confession were substantially adopted; and by the end of the year there were some 300 congregations.

But German Catholicism was destined soon to find enemies both within and without. To say nothing of orthodox Catholics, conservative Protestantism began to suspect it as undermining religion. And, as the movement fell in with the liberal tendencies of the times, the governments took the alarm, and set themselves to check its spread. Saxony took the lead, and Prussia soon followed, in imposing vexatious restrictions upon the 'Dissidents;' in Baden they were denied the rights of citizens, while Austria expelled them from her territories. It was more, however, internal disagreements than state persecutions that checked the prosperity of German Catholicism. Czerski and his adherents held closely by the doctrines and ritual of Rome; while Ronge's party approached nearer and nearer to the extreme Rationalists, and, leaving the province of religion altogether, occupied themselves with freethinking theories and democratic politics. When the great storm of 1848 burst, Ronge was active in travelling and preaching, and, although his freethinking and political tendencies were repudiated by numbers of the body, they predominated in many places. After the political reaction set in, strong measures were taken against the German Catholics. The early enthusiasm of the movement apparently died out, and after the dissolution of the Frankfort parliament Ronge retired to London (in 1861 he returned to Germany, and lived successively at Breslau, Frankfort, Darmstadt, and Vienna). In 1850 a conference was held between the German Catholics and the 'Free Congregations' (*Freie Gemeinden*), an association of freethinking congregations which had been gradually forming since 1844 by secession from the Protestant Church, and with which an incorporate union was effected in 1859. Six years later the council refused to commit itself to belief in a personal God. From a membership of 13,000 in 1867 in Prussia and Saxony, the body has gradually dwindled to almost total extinction. The Old Catholics (q.v.) may be regarded as having superseded the German Catholic movement. See Kampe's *Geschichte des Deutsch-katholicismus* (1860).

German, Cousin-. See COUSIN.

Germander (*Teucrium*), a large and widely distributed genus of labiate herbs, of which all the European species are of old medicinal repute on account of their aromatic, bitter, and stomachic properties. The species are numerous. The Wall Germander or True Germander (*T. chamædrys*), often found on ruined walls, has probably been introduced from the south of Europe. With the German *T. Botrys*, it enjoyed a high reputation in the treatment of gout. Wood Germander or Wood Sage (*T. Scorodonia*) is a very common British plant, in dry bushy or rocky places. It is very bitter and slightly aromatic. It is used in Jersey as a substitute for hops. Water Germander (*T. Scordium*), in wet meadows, has a smell like garlic. Cat or Sea Thyme (*T. Marum*), of southern Europe, like catmint and valerian root, has great attractiveness for cats. It is still sometimes used in the preparation of sneezing powders.

Germanicus Cæsar, a distinguished Roman general, was the son of Nero Claudius Drusus, and of Antonia, daughter of Mark Antony and niece of Augustus. He was born 15 B.C., and by desire of Augustus was adopted in the year 4 A.D. by Tiberius, whom he accompanied in the war against the Pannonians, Dalmatians, and Germans. In the year 12 he was consul, and next year was appointed to the command of the eight legions on the Rhine. In 14 he was at Lugdunum Batavorum when news came of the death of the Emperor Augustus and of the mutiny for more pay and shorter service among the soldiers in Germany and Illyricum. Germanicus hastened to the camp and quelled the tumult by his personal popularity; and at once led his soldiers against the enemy. Crossing the Rhine below Wesel, he attacked and routed the Marsi, and next year marched to meet the redoubtable Arminius (q.v.), the conqueror of Varus and his legionaries, whose bones had lain whitening for six years in the Teutoburg Forest. With solemn rites his soldiers buried these sad relics of disaster, then advanced against the foe, who, retiring into a difficult country, managed to save himself, and was not subdued until the year after, when Germanicus again carried a part of his army up the Ems in ships, crossed to the Weser, and completely overthrew Arminius in two desperate battles. The victories thus achieved were to have been followed up in the succeeding years, but Tiberius, jealous of the glory and popularity of Germanicus, recalled him from Germany in the year 17, and sent him to settle affairs in the East, at the same time appointing as viceroy of Syria, in order secretly to counteract him, the haughty and envious Cn. Calpurnius Piso. Germanicus died at Epidaphnæ, near Antioch, 9th October 19, probably of poison, to the profound sorrow of provincials and Romans alike. His wife, Agrippina, and two of her sons were put to death by order of Tiberius; the third son, Caligula, was spared. Of the three daughters who survived their father, Agrippina became as remarkable for her

vices as her mother had been for her virtues. Germanicus is one of the most attractive heroes of Roman history. The courage and success of the soldiership that had blotted out a great national disgrace, the noble magnanimity of his private character, the simplicity and purity of his life, and the shadow of impending death that touched him with romantic interest, combined to make him the darling of his contemporaries, and has left him, as portrayed in the pages of Tacitus (*Annals*, i. and ii.), still a figure of unique interest to us.

Germanium, a metallic element discovered in 1885 by Dr Winkler in a silver ore (argyrodite); symbol, Ge; atomic weight, 72·3. It has a melting-point about 1650° F. (900° C.); is oxidised when heated in air; crystallises in octahedra; has a perfectly metallic lustre, and is of a grayish-white colour. As gallium had been named from France, the new metal was named after Germany. Fifteen years before its discovery its existence was prophesied by Mendeleëff as required to fill the gap in the periodic table between silicon and tin. See Atomic Theory.

German Ocean. See North Sea.

German Silver. This is a triple alloy of copper, nickel, and zinc, and is sometimes called nickel silver. The best quality of it consists of four parts copper, two parts nickel, and two parts zinc, but this quality is the most difficult to work. For some purposes the proportion of copper is slightly increased, and for articles which are to be cast instead of stamped or hammered about 2 per cent. of lead is added. To make a good malleable alloy, the three metals of which it is composed should all be of the best quality. German silver has a tendency to crack in Annealing (q.v.), and is all the more liable to do this if its component metals are impure. Its crystalline structure is got rid of by hammering, rolling, and annealing. It is harder and tougher than brass, and takes a fine polish. In colour it is sufficiently near silver to make it valuable for plating with that metal. This, together with its hardness in resisting wear, has caused a great demand for German silver for certain wares made in Birmingham and Sheffield.

Spoons and forks of this alloy are made in immense numbers. Such articles as salvers, dish-covers, jugs, teapots, and the like are also largely made of it, but these objects, or at least some of them, are still more largely made of Britannia Metal (q.v.), a greatly inferior alloy, because much softer. German silver has a coppery odour, and is readily attacked by acid liquids, such as vinegar, which coat it with verdigris. Spoons and forks made of this alloy should therefore either be plated with silver or carefully kept clean.

Of late years, through care in preparing a suitable alloy, large objects, such as the bodies of jugs and coffee-pots, can be formed of sheet German silver by 'spinning' it on the lathe, instead of by stamping or by the slow process of hammering. Formerly it was only a soft alloy like Britannia metal that could be so treated. For some time past there has been a tendency to substitute for electroplate—i.e. German silver plated with real silver—white alloys having nickel for their basis. These, however, are but varieties of German silver known under different names, such as silveroid, argentoid, navoline, and nickeline. Some of them contain small quantities of tin, cadmium, and other metals. Mountings for ship-cabins, bar-fittings, and also forks and spoons have been manufactured on a considerable scale from these new alloys.

German Tinder. See Amadou.

Germantown, a former borough of Pennsylvania, included since 1854 in the limits of Philadelphia. Here an attack by Washington on the British camp, in the early morning of 4th October 1777, was repulsed, the Americans losing 1000 men, the British 600.

Germanus, St, was Bishop of Auxerre, and is said to have been invited over to Britain to combat Pelagianism in 429. Acting under his directions the Christian Britons won the bloodless 'Alleluia Victory' over the Picts and Saxons. In 1736 a column was erected on the supposed site, Maes Garmon (Germanus' field), in Flintshire. There are several churches in Wales and Cornwall dedicated to St Germanus.

Germany (from Lat. *Germania*) is the English name of the country which the natives call Deutschland, and the French L'Allemagne (see Alemanni). The word is sometimes used to denote the whole area of the European continent within which the Germanic race and language are dominant. In this broad sense it includes, besides Germany proper, parts of Austria, Switzerland, and perhaps even of the Netherlands; but in the present article the name is to be understood as denoting the existing Germanic empire, of which Prussia is the head. Germany occupies the central portions of Europe, and extends from 5° 52′ to 22° 53′ E. long., and from 47° 16′ to 55° 54′ N. lat. It is bounded on the N. by the German Ocean, the Danish peninsula, and the Baltic; on the E. by Russia and Austria; on the S. by Austria and Switzerland; and on the W. by France, Belgium, and the Netherlands. The population in 1871 was 41,058,792; in 1880, 45,234,061; in 1895, 52,279,901. Its area is 211,168 sq. m., or about $\frac{1}{16}$th of that of all Europe—slightly larger than France, but not twice as large as Great Britain and Ireland. The coast-line measures about 950 miles.

Germany is composed of a federation of twenty-five states, with one common imperial province, the names of which, with their areas and populations in 1895, are given in the following list. Heligoland was ceded by Britain to Germany in 1890. The population of the empire in 1890 was 49,428,803.

States	Area	Population 1895
Kingdoms—		
1. Prussia	136,073	31,855,193
2. Bavaria	[illegible]	5,818,544
3. Saxony	[illegible]	3,787,688
4. Wurtemberg	7,619	2,081,151
Grand-Duchies—		
5. Baden	5,891	1,725,464
6. Hesse	[illegible]	1,039,020
7. Mecklenburg-Schwerin	5,197	597,436
8. Saxe-Weimar	1,404	339,217
9. Mecklenburg-Strelitz	1,144	101,540
10. Oldenburg	2,508	373,739
Duchies—		
11. Brunswick	1,441	434,213
12. Saxe-Meiningen	954	234,005
13. Saxe-Altenburg	511	180,[illegible]
14. Saxe-Coburg-Gotha	765	216,[illegible]
15. Anhalt	917	293,[illegible]
Principalities—		
16. Schwarzburg-Sondershausen	363	78,074
17. Schwarzburg-Rudolstadt	367	88,[illegible]
18. Waldeck	[illegible]	57,[illegible]
19. Reuss-Greiz	[illegible]	67,408
20. Reuss-Schleiz	323	132,130
21. Schaumburg-Lippe	133	41,[illegible]
22. Lippe-Detmold	475	1[illegible]4
Free Towns—		
23. Lübeck	116	83,324
24. Bremen	100	[illegible]
25. Hamburg	160	681,[illegible]
Reichsland—		
26. Alsace-Lorraine	5,568	[illegible]
	[illegible]	[illegible]

These several sovereign states vary enormously in area and influence. Thus, while Prussia alone exceeds the British Islands in area, Bavaria is almost as large as Scotland, Wurtemberg is larger

than Wales, and Baden and Saxony are neither of them equal to Yorkshire. Waldeck is about equal to Bedford, and Reuss Greiz is smaller than Rutland, the smallest English county. The Duke of Sutherland's estates (1838 sq. m.) are larger in area than all Mecklenburg-Strelitz, or than all Brunswick, respectively tenth and ninth in size of the German states. The Duke of Buccleuch's Scottish estates alone (676 sq. m.) exceed in area Saxe-Altenburg or any of the eleven smaller states.

In 1895 Berlin, the capital of the empire, had 1,677,304 inhabitants; Hamburg, 625,552; Breslau, 373,169; Munich, 407,307; Dresden, 336,440; Leipzig, 399,963. There were in all 28 towns with a population of above 100,000; 116 between 20,000 and 100,000; 683 between 5000 and 20,000; and 1951 between 2000 and 5000.

Besides the political divisions above mentioned, there are certain distinctive appellations applied to different parts of Germany, which have been derived either from the names and settlements of the ancient Germanic tribes, or from the circles and other great subdivisions of the old empire. Thus, the name of 'Swabia' is still applied in common parlance to the districts embracing the greater part of Wurtemberg, southern Baden, south-western Bavaria, and Hohenzollern; 'Franconia,' to the Main districts of Bamberg, Schweinfurt, and Wurzburg; 'the Palatinate,' to Rhenish Bavaria and the north of Baden; 'the Rhineland,' to portions of Baden, Rhenish Prussia, Bavaria, Hesse-Darmstadt, and Nassau; 'Voigtland,' to the high ground between Hof and Plauen; 'Thuringia,' to the districts lying between the Upper Saale and the Werra, as Saxe-Weimar, &c.; 'Lusatia,' to the eastern part of Saxony; 'East Friesland,' to the country between the Lower Weser and Ems; and 'Westphalia,' to the district extending between Lower Saxony, the Netherlands, Thuringia, and Hesse, to the German Ocean. The four Saxon duchies and the four Schwarzburg and Reuss principalities are frequently grouped together as the 'Thuringian States.'

Physical Character. Germany presents two very distinct physical formations. (1) A range of high tableland, occupying the centre and southern parts of the country, interspersed with numerous ranges and groups of mountains, the most important of which are the Harz and Teutoburgerwald, in the north; the Taunus, Thüringerwald, Erzgebirge, and Riesengebirge, in the middle; and the Black Forest (Schwarzwald), Rauhe Alb, and Bavarian Alps in the south; and containing an area, including Alsace and Lorraine, of 110,000 sq. m. The Brocken is 3740 feet high; the Vosges reach 4700; the Feldberg in the Black Forest is 4903; and the Zugspitz in the Noric Alps of Bavaria, the highest peak in Germany, is 9665 feet in height. (2) A vast sandy plain, which extends from the centre of the empire north to the German Ocean, and including Sleswick-Holstein, contains an area of about 98,000 sq. m. This great plain, stretching from the Russian frontier on the east to the Netherlands on the west, is varied by two terrace-like elevations. The one stretches from the Vistula into Mecklenburg, at no great distance from the coast of the Baltic, and has a mean elevation of 500 to 600 feet, rising in one point near Danzig to 1020 feet; the other line of elevations begins in Silesia and terminates in the moorlands of Lüneburg in Hanover, its course being marked by several summits from 500 to 800 feet in height. A large portion of the plain is occupied by sandy tracts interspersed with deposits of peat; but other parts are moderately fertile, and admit of successful cultivation.

The surface of Germany may be regarded as belonging to three drainage basins. The Danube (q.v.) from its source in the Black Forest to the borders of Austria belongs to Germany; and through its channel the waters of the greater part of Bavaria are poured into the Black Sea. Its chief tributaries are the Iller, Lech, Isar, and Inn on the right; and the Altmühl, Nab, and Regen on the left. By far the greater part of the surface (about 185,000 sq. m.) has a northern slope, and belongs partly to the basin of the North Sea, partly to that of the Baltic. The chief German streams flowing into the North Sea are the Rhine (q.v.), with its tributaries the Neckar, Main, Lahn, Sieg, Wupper, Ruhr, and Lippe on the right, and the Ill and Moselle on the left; the Weser (q.v.), with its tributary the Aller; and the Elbe (q.v.), with its tributaries the Havel, Mulde, and Saale. Into the Baltic flow the Oder (q.v.), with its tributaries the Warthe, Neisse, and Bober; the Vistula (q.v.), or in German Weichsel, with its tributaries the Narew, Drewenz, and Brahe; the Memel; and the Pregel.

The natural and artificial waterways of Germany are extensive, especially in the northern plain. The most important of the numerous canals which connect the great river-systems of Germany are Ludwig's Canal (110 miles long) in Bavaria, which, by uniting the Danube and Main, opens a communication between the Black Sea and the German Ocean; the Finow (40 miles) and Friedrich-Wilhelm's (20 miles) canals in Brandenburg; the Plaue Canal (20 miles), between the Elbe and the Havel; the Kiel and Eider Canal (21 miles), uniting the Baltic and German Ocean; and the canals between the Oder and Vistula, Rhine and Rhone (225 miles), and Rhine, Marne, and Seine (165 miles). The North Sea and Baltic Canal, from Brunsbüttel at the mouth of the Elbe to Kiel, begun in 1887 and finished in 1895, was designed mainly for the use of warships. Numerous lakes occur both in the tableland of southern Germany (Bavaria) and in the low lands of the northern districts, but few of them are of any great size. The so-called 'Haffs' of the north coasts are extensive bays of the sea, but so curiously landlocked as to practically form huge salt-water lagoons or coast-lakes. The chief are the Stettiner Haff, the Frische Haff at Königsberg, and the Kurische Haff at Memel. Germany abounds in swamps and marsh-lands, which are especially numerous in the low northern districts. Its mineral springs occur principally in Nassau, Würtemberg, Baden, Bavaria, and Rhenish Prussia. Many of these springs have retained their high reputation from the earliest ages.

Geology.—The great plain of North Germany consists of strata of the same age as the Tertiary strata of the Paris basin, covered with very recent sand and mud. Newer Tertiary beds occupy the river-basin of the Rhine north from Mainz; they consist of fine light-coloured loam, and contain the bones of the mammoth, rhinoceros, and other contemporaneous mammals. Erratics are scattered over the north of Germany. The whole district in the centre of Germany, from the Danube northwards to Hanover, consists of Secondary strata. The rocks of the Trias period are best known in Germany, the typical rocks of Bunter Sandstein, Muschelkalk, and Keuper being developed here so as to justify the name Trias. The Trias is highly fossiliferous, abounding especially in marine shells, and containing several genera of remarkable labyrinthodont saurians. Jurassic rocks occur in central Germany; at Hanover they consist of clays and marl, with beds of sandstone and limestone, containing coal and ironstone of such value that they have been extensively wrought. Intruded igneous rocks have tilted the beds of the Cretaceous strata in some districts to a nearly vertical position, and have metamorphosed them into crystalline marbles and siliceous sandstones.

Of the Palæozoic rocks, the Carboniferous strata are almost entirely absent from Germany. The

coal obtained in the country is from rocks of a later age. True coal-beds are found in Rhenish Prussia. The sedimentary rocks of the Harz Mountains are chiefly Devonian; to the south-east, near Harzgerode, they are Upper Silurian. They are all greatly dislocated by granite and other intrusive rocks. The Harz Mountains are surrounded by a zone of Permian rocks. The stratified rocks of the Thüringerwald are also Devonian, resting on Lower Silurian strata, the lower portion of which is highly metamorphosed into quartzose schists; the remainder consists of graywacke, slate, and sandstone, with limestone and alum slates. There are numerous fucoid and annelid impressions in the older beds, and graptolites, orthoceratites, and trilobites in the newer. The basaltic rocks, trachytes, and other volcanic products are largely developed in the Eifel, Siebengebirge, Westerwald, Vogels, Rhöngebirge, and other mountain-systems of central Germany.

Climate.—The climate of Germany presents less diversity than a first glance at the map might lead one to infer, for the greater heats of the more southern latitudes are considerably modified by the hilly character of the country in those parallels, while the cold of the northern plains is mitigated by their vicinity to the ocean. The average decrease in the mean temperature is, in going from south to north, about 1° F. for every 52 miles; and in going from west to east, about 1° F. for every 72 miles. The line of perpetual snow varies from 7200 to 8000 feet above the level of the sea. The mean annual rainfall is 20 inches. The rainfall is heaviest on the coast and in the mountains; least in Silesia, on the Danube at Sigmaringen, in Rhenish Bavaria, and at Wustrow in Mecklenburg. The rainfall in the Upper Harz reaches 66 inches. The difference between the greatest heat and the greatest cold in Germany is about 130° F. January is the coldest and July the warmest month. The following table shows the mean annual records of the temperature at different points of the continent:

	Annual mean	Summer	Winter
Hamburg	47° F.	64° F.	30° F.
Dresden	48	67	29
Frankfort-on-the-Main	48·5	66	31
Berlin	46·5	66	27
Hanover	48	63	33
Königsberg	43	62	24

Products.—The mineral products of Germany are very rich and varied, and their exploitation forms a most important industry. The chief mining and smelting districts are in Silesia, on the Lower Rhine, in the Upper Harz, and in Saxony. Silver is found in the Upper Harz and Saxony. Iron occurs in numerous mountain-ranges, especially in Upper Silesia and in Rhenish Westphalia. Alsace and Lorraine contain a great part of perhaps the largest iron-deposit in Europe, which stretches into France and Luxemburg. The iron of the Thüringerwald is fine, though not abundant. The chief coalfields are in Silesia, Westphalia (on the Ruhr), and Saxony—the first containing the largest coalfield in Europe. Prussia yields nearly one-half of the zinc annually produced in the world. Lead is found in the Harz, in other parts of Prussia, and in Saxony. A little copper is mined at Mansfeld. Tin and tungsten are yielded by the Erzgebirge; manganese at Wiesbaden; quicksilver in Westphalia; antimony in Thuringia. Salt is produced at Halle, Stassfürt, and other parts of Prussia. Germany is rich in clays of all kinds, from the finest to the coarsest: the porcelain of Meissen, the pottery of Thuringia, and the glass of Silesia and Bavaria are celebrated. Building stone is well distributed; marble, alabaster, slates, and lithographic stones also occur; and cobalt, arsenic, sulphur, saltpetre, alum, gypsum, bismuth, pumice-stone, Tripoli slate, kaolin, emery, ochre, and vitriol are all among the exports of Germany. The following table shows the production of the five years 1882–86, with the yearly average, and the produce for 1887 and 1894, of the chief minerals of Germany (including the Duchy of Luxemburg):

	1882–1886 tons	Yearly Average tons	Produce in 1887 tons	Produce in 1894 tons
Anthracite	281,672,500	56,334,500	60,334,000	76,772,700
Lignite	73,620,300	14,724,060	15,898,600	22,103,400
Salt	7,051,700	1,410,340	1,485,500	735,500
Iron ore	43,669,300	8,733,860	9,351,100	12,403,800
Zinc ore	3,290,400	658,080	900,700	728,600
Lead ore	820,700	165,340	157,000	162,700
Copper ore	2,890,100	578,020	567,600	588,200

In the returns for 1894 there are also 1,643,600 tons of potassic salt and 290,500 tons of 'other products.' Silver to the amount of 450 tons was produced in 1893, with 3074 kilograms of gold; and nickel, bismuth, vitriol, and other chemical manufactures of a total weight of 29,098 tons.

Cereals are extensively cultivated in the north, but the value of the wheat, barley, oats, and rye imported exceeds the value of that exported by £2,500,000 a year. The export of potatoes exceeds the imports by £400,000. Hemp and flax, madder, woad, and saffron grow well in the central districts, where the vine, the cultivation of which extends in suitable localities as far north as 51°, is brought to great perfection. The best wine-producing districts are the valleys of the Danube, Rhine, Main, Neckar, and Moselle, which are, moreover, generally noted for the excellence of their fruits and vegetables. The best tobacco is grown on the Upper Rhine, on the Neckar, and in Alsace, but inferior qualities are largely produced elsewhere. The hops of Bavaria have a high reputation, and the chicory grown in that country, and in the district between the Elbe and Weser, is used all over Europe as a substitute for coffee. Magdeburg is the centre of a large beetroot-growing industry. According to the survey of 1883, corrected for 1887, 48·7 per cent. (65,779,920 acres) of the entire area of the empire was given up to arable land, garden-land, and vineyards. Anhalt had the highest proportion of such land; and, excluding the domains of the free towns, Oldenburg had the lowest. About 20·3 per cent. (27,361,428 acres) was occupied by heath, meadow, and pasture, Oldenburg containing the greatest proportion, and Saxe-Coburg-Gotha the lowest. The chief crops in 1887 were meadow-hay, 14,778,650 acres; rye, 14,605,700 acres; oats, 9,525,610 acres; potatoes, 7,295,368 acres; wheat, 4,799,200 acres; barley, 4,327,800 acres; and spelt, 926,790 acres. In 1887–88 tobacco occupied 53,665 acres; in 1881–82, 68,120 acres. Vines covered 300,525 acres in 1887–88, and yielded 52,624,924 gallons of wine. The most extensive forests are found in central Germany, while the deficiency of wood in the north-west parts of the great plain is in some degree met by the abundance of turf. Germany in 1883 had 34,770,995 acres (25·7 per cent. of its area) in woods and forest. Schwarzburg-Rudolstadt had the highest proportion of area devoted to forest; and, excluding the free-towns, Oldenburg had the lowest. The largest forests are of firs and red pines (as in the Black Forest, Upper Harz, Thüringerwald, and Riesengebirge), beech (Lower Harz and Baltic coast), pines (east of Elbe, Bavaria, Franconia, and on the Rhine), and oaks (Lower Rhine, Westphalia, Odenwald, and Upper Silesia).

Germany has long been noted for the good breed of horses raised in the north; Saxony, Silesia, and Brandenburg have an equal reputation for their sheep and the fine quality of the wool which they yield; and the rich alluvial flats of Mecklenburg

and Hanover are celebrated for their cattle. The forests of northern and central Germany abound in small game of various kinds; and a few still shelter wild boars. The Bavarian Alps afford shelter to the larger animals, as the chamois, the red deer and wild goat, the fox and marten. Wolves are still found in Bavaria, the eastern provinces of Prussia, and in Lorraine. The bear is now extinct, and the beaver nearly so. In all the plains in the north storks, wild geese, and ducks are abundant. Among the fishes of Germany the most generally distributed are carp, salmon, trout, and eels; the rivers contain also crayfish, pearl-bearing mussels, and leeches. The oyster, herring, and cod fisheries constitute important branches of industry on the German shores of the Baltic and North Sea. Germany stands next to Great Britain in regard to the care and success with which its agricultural, mining, and other natural capabilities have been cultivated. All the German states, and especially Prussia, Saxony, and Bavaria, encourage agriculture, and have endeavoured, by the establishment of agricultural colleges and exhibitions, to diffuse among the people a knowledge of recent scientific appliances. Forestry receives almost as much attention in Germany as agriculture; and, like the latter, is elevated to the rank of a science. The larger woods and forests in most of the states belong to the government, and are under the care of special boards of management, which exercise the right of supervision and control over all forest lands, whether public or private.

Manufactures.—The oldest and most important of the German industrial arts are the manufactures of linen and woollen goods. The chief localities for the cultivation and preparation of flax, and the weaving of linen fabrics, are the mountain-valleys of Silesia, Lusatia, Westphalia, and Saxony (for thread-laces); while cotton fabrics are principally made in Rhenish Prussia and Saxony. The same districts, together with Pomerania, Bavaria, Alsace, Würtemberg, and Baden, manufacture the choicest woollen fabrics, including damasks and carpets. The silk industry has its central point in Rhenish Prussia, with a special development in the district of Düsseldorf. Germany rivals France more keenly in the production of satins than in that of heavier all-silk goods. Jute-spinning is carried on in Brunswick, at Meissen, and at Bonn; thread is manufactured in Saxony, Silesia, and the Rhine provinces; and hosiery is most largely produced in Saxony and Thuringia. The making of toys and wooden clocks, and wood-carving, which may be regarded as almost a speciality of German industry, flourish in the hilly districts of Saxony, Bavaria, and the Black Forest. Paper is made chiefly in the districts of Aix-la-Chapelle, Arnsberg, and Liegnitz, and in Saxony. Tanning, especially in the south-west, is an ancient German industry. The best iron and steel manufactures belong to Silesia, Hanover, and Saxony: in 1893, 4,986,000 metric tons representing a value of £10,800,000 were handled in the foundries of Germany. Silesia probably possesses the finest glass-manufactories, but those of Bavaria are also important; while Saxony and Prussia stand pre-eminent for the excellence of their china and earthenware. Augsburg and Nuremberg dispute with Munich and Berlin the title to pre-eminence in silver, gold, and jewelry work, and in the manufacture of philosophical and musical instruments; while Leipzig and Munich claim the first rank for typefounding, printing, and lithography. The trading cities of northern Germany nearly monopolise the entire business connected with the preparation of tobacco, snuff, &c., the distillation of spirits from the potato and other roots, and the manufacture of beet-root sugar; while vinegar and oils are prepared almost exclusively in central and southern Germany. In 1896–97, 1,352,538,000 gallons of beer were brewed in the German empire, the chief producing states being Prussia (608,966,000 gals.) and Bavaria (356,356,000 gals.). The annual consumption per head of the population is 21 gallons. According to the industrial census of 1882, the number of persons in Germany engaged in manufactures and commerce was 7,966,783. The following figures, showing the distribution of that total, afford a view of the comparative importance of the various industries: Clothing, washing, &c., 1,334,007; building and related industries, 946,583; retail trading, 853,827; textile industries, 850,859; metal-working, carriage and ship building, &c., 813,906; preparation of food and food-materials, 663,226; mining (including founding and salt-winning), 552,020; workers in wood and wicker, 521,660; postal service, transport, &c., 437,040; lodging and refreshment, 279,451; industries in stone, earth, clay, 221,006; paper and leather working, 220,039; chemicals and lighting materials, 88,397; printing, &c., 69,643; art industries, 23,893; miscellaneous, 91,226. Besides these, 8,065,350 were engaged in agriculture, 91,630 in forestry and hunting, 55,168 in horticulture, and 24,348 in fishing.

Commerce and Shipping. The multiplicity of small states into which the German land was long broken up opposed great obstacles to the development of commerce; but the difficulty was to some extent obviated by the establishment of the Zollverein (q.v.), or Customs and Trade Confederation, and partly also by the absorption of several of the smaller states by Prussia. In 1871 a *Zollund Handels-Gebiet* (Customs and Trade Territory) was formed in Germany, including Luxemburg (1010 sq. m.; 213,283 inhabitants in 1885) and the Austrian district of Jungholz (212 inhabitants), but excluding Hamburg, Bremen, and parts of Oldenburg, Prussia, and Baden (together 140 sq. m.; 754,705 inhabitants). On October 15, 1888, however, all these districts entered the union, with the exception of the Baden territory (1054 inhabitants), and part of the old free-port of Hamburg (152 inhabitants). The old Zollverein parliament is represented by the Reichstag, and the Zollverein council by the Bundesrath, which appoints three permanent committees—for finance, for excise and customs, and for trade. The revenues of the union are derived from customs duties upon imports, and from excise duties on tobacco, salt, beetroot-sugar, brandy, malt, &c., and are divided among the different states according to the populations.

The following table shows the exports of home produce and the imports for home consumption in 1888, for the customs union as constituted before October of that year:

Order. Class.		Exports.	Imports.
1.	Living animals	£4,725,350	£7,783,200
2.	Subsistence, Tobacco	1,308,900	2,129,800
3.	Articles [illegible]	1,057,550	4,051,100
4.	[illegible]	[illegible]	[illegible]
5.	Raw materials	[illegible]	37,564,350
6.	Textile materials, &c.	1,350,000	10,763,950
7.	Combustible materials	11,305,450	12,142,250
8.	Stones, earths, glass	5,870,450	2,559,650
9.	Metals and metal goods	24,334,950	15,857,500
10.	Wood and wooden wares	[illegible]	[illegible]
11.	Paper	[illegible]	[illegible]
12.	Leather and leather goods	11,846,100	8,366,050
13.	Instruments and [illegible]	53,761,950	51,271,250
14.	Chemicals	[illegible]	1,420,100
15.	Carriages, Furniture, &c.	142,350	25,500
16.	Machinery and instruments	6,667,100	2,472,500
17.	Hardware, tools, &c.	4,[illegible]	1,276,000
18.	Literature, art, &c.	3,619,800	1,314,550
19.	Miscellaneous	35,050	
	Total	£167,730,100	£171,793,550

The total exports for the same year were £243,154,050; imports, £254,710,800. In 1898 the total exports of home produce had increased to £200,582,250, while the imports for home consumption were £271,983,800. In 1881 the exports of home produce from Germany to Britain were £23,650,285, and in 1898 £28,534,159; while the imports of British produce were respectively £17,431,439 and £22,525,937. Including foreign and colonial produce, the imports from Britain in 1898 were £33,331,701. Among the principal articles exported to Britain in 1898 were sugar and glucose, £9,570,784; wood, £1,271,210; wool and woollen manufactures, £974,717; glass, £898,000; iron manufactures, £830,211; hides and leather, £814,169; cotton and yarn, £805,155; eggs, £788,844; butter and margarine (decreasing), £251,374. The principal articles imported from Britain were woollen, cotton, and alpaca goods and yarns, iron, machinery, coal, herrings, and linen.

The German mercantile fleet is the fourth in the world, being excelled only by those of Great Britain, the United States, and Norway. In 1895 it consisted of 2622 sailing ships of 660,856 tons burden, and 1043 steamers, of 893,046 tons; making a total of 3665 vessels of 1,553,902 tons. The leading ports are Hamburg, Bremerhaven (for Bremen), Stettin, Danzig, Kiel, Lübeck, and Königsberg. In 1893 there entered German ports 66,655 vessels, of 14,621,634 tons, and cleared 67,219 ships, of 14,724,658 tons. Of the shipping entering 3,052,450, tons were British, and 699,000 tons Danish; 5,591,000 tons were German. Besides this maritime shipping trade, Germany carries on a very active commerce between its own internal ports, by means of 20,390 vessels (1153 steamers), plying on the numerous navigable rivers and canals.

In her commercial policy Germany has of late years committed herself more and more to protection; and by a law of July 1879 a protective policy was substituted for the previous free-trading principles of the empire. The chaos of coinages in use before the establishment of the empire has been rectified by the substitution (1873) of a uniform imperial system, the standard being gold (see BIMETALLISM). The silver mark, superseding guldens and thalers, is almost exactly equal to a shilling in value. Since 1872 the metrical system of weights and measures has been in use.

Railways, &c.—The first railway in Germany was the Ludwigsbahn between Nuremberg and Furth, completed in 1835; but the first of any length was built between Leipzig and Dresden in 1837–39. In 1900 the railways in Germany, completed and open for traffic, amounted to 32,000 English miles. Of these only 3000 miles belonged to private companies, all the remainder being Government lines; about 900 miles had narrow-gauge lines.

The postal and telegraphic systems of all the German states, except Bavaria and Würtemberg, are now under a central imperial administration; and since 1872, in accordance with treaties concluded between Austria and Prussia, a German-Austrian postal union has been established. At the end of the century there were 36,000 post-offices in the empire, and 23,000 telegraph offices; while 900 towns had telephonic communication. The total length of telegraph lines was about 80,000 English miles, with 300,000 English miles of wires. The total number of hands employed was 200,000. The total receipts were close on £20,000,000, and the expenditure £18,000,000.

Population, &c. Four-fifths of the population of this country are of the race called in English Germans, in French Allemands, but by the people themselves Deutsche. The term Deutsch, in Gothic *thiudisk*, in Old High Ger. *diutisc* (Latinised into *theotiscus*), is derived from the Gothic substantive *thiuda*, 'people,' and therefore meant originally the popular language; or, in the mouth of the learned, the vulgar tongue. In the 12th and 13th centuries it became the accepted designation both of this widespread tongue and of the race that speak it.

The German-speaking inhabitants of the empire number upwards of 43,000,000; but a considerable proportion of these are not of the Germanic stock. Among the peoples retaining their own language (about 3¼ millions) are Poles (exclusively in eastern and north-eastern Prussia), 2,450,000; Wends (in Silesia, Brandenburg, and Saxony), 140,000; Czechs (in Silesia), 50,000; Lithuanians (in eastern Prussia), 150,000; Danes (in Sleswick), 140,000; French (in Rhenish Prussia, Alsace, and Lorraine) and Walloons (about Aix-la-Chapelle in Rhenish Prussia), 280,000. The Germans are divided into High and Low Germans; the language of the former is the cultivated language of all the German states; that of the latter, known as *Platt-Deutsch*, is spoken in the north and north-west. As to the colour of the hair, Professor Virchow caused observations to be made on the hair of 1,758,827 school children, four-fifths of the total number. The result showed that 31·80 per cent. belonged to the blonde type; 14·05 to the brunette type; and 54·15 to the intermediate type. The blondes were most numerous in North Germany, the brunettes in South Germany.

It is computed that there are 23,000,000 Germans beyond the boundary of the empire, of whom 9½ millions are in Austria, 7 in the United States, 2 in Switzerland, 400,000 in Poland (besides 800,000 German Jews). There are also many in the Volga country, in middle and south Russia, Roumania, and Turkey.

The average density of the population of Germany is about 222 per sq. m. The most densely populated country of the empire is Saxony, with 513 per sq. m.; the most sparsely populated is Mecklenburg-Strelitz, with 87 per sq. m. The concentration of the population in large towns is not so common in Germany as in some other countries. Although in 1885 there were 137 towns with 20,000 inhabitants and upwards, only one of these reached a million, three others 250,000 (see p. 172), and seventeen others 100,000; twenty-three had between 50,000 and 100,000.

Emigration.—During the last fifty years emigration from Germany has assumed very large proportions; but since 1881, when the highest total (220,798) was reached, the annual number of emigrants has greatly decreased. Between 1830 and 1887 it is calculated that about 4,200,000 emigrants left the country, five-sevenths of whom were bound for the United States of North America. The others went, in varying proportions, to South America, Australia, Canada, Africa, and Asia. In 1851–60 about 1,130,000 emigrants left Germany; in 1860–71, 970,000; in 1871–80, 595,150; and in 1881–88, 1,143,570. In 1886 the number was 83,218; in 1887, 103,055; and in 1888, 98,515, besides about 4000 sailing from French ports. By far the largest proportion of emigrants come from the northern parts of the empire: in 1888 the provinces of Posen and West Prussia each contributed over 12,000 to the Prussian total of 63,000. Bavaria sent 12,200; Würtemberg, 6500; Saxony, 2300. In 1894 the total number of emigrants was only 40,964. On the other hand there were in 1890, 508,594 foreigners in Germany, of whom 205,545 were Austrians and 15,534 were born in Great Britain and Ireland.

Colonies.—The steady stream of emigration from Germany renders it natural that Germany

should wish to extend her territory, and in 1884–89 these regions (besides Kiao-chow, ceded by China in 1897; the Samoan Islands, Savaii, and Upolu, by treaties with United States and Britain, 1898; and the Caroline, Ladrone, and Pelew Islands, by treaty with Spain, 1899) have become German possessions or come under German protection:

	Area in Square Miles	Population
I. Africa		
Cameroon, on the Slave Coast	400	40,000
Coast-line	115,000	200,000
Damaraland and Great Namaqualand	350,000	
Protectorate, in East Africa	60,000	
Witu land	7,500	
German Protectorate, acquired partly with British and Zanzibar	240,000	
II. Polynesia		
Marshall Islands	150	10,000
Kaiser Wilhelm Land, in New Guinea	70,300	[illegible]000
Bismarck Archipelago, New Britain, &c.	18,150	188,000
Solomon Islands	8,500	80,000

Education. Education is more generally diffused in Germany than in any other country of Europe, and is cultivated with an earnest and systematic devotion not met with to an equal extent among other nations. Besides the Academy at Munster (founded 1780; 176 students) and the small Lyceum at Braunsberg (1568), which have only the two faculties of Philosophy and Catholic Theology, there are 20 universities: Heidelberg (1386), Würzburg (1402), Leipzig (1409), Rostock (1419), Greifswald (1456), Freiburg (1457), Munich (1472), Tübingen (1477), Marburg (1527), Königsberg (1544), Jena (1557), Giessen (1607), Kiel (1665), Göttingen (1734), Erlangen (1743), Berlin (1809), Breslau (1811), Halle (1817), Bonn (1818), Strasburg (1872). These institutions embrace the four faculties of Theology, Law, Medicine, and Philosophy; in 1889 they had 2260 professors and teachers, and in 1888–89 (winter session) 28,550 students. Berlin (5790 students), Leipzig (3430), and Munich (3602) are the largest universities; Jena (463) and Rostock (346) the smallest. Of the universities, 14 are Protestant—i.e. in the department of theology they teach only Protestant theology; three are Roman Catholic—viz. Freiburg, Munich, and Würzburg; three—viz. Bonn, Breslau, and Tübingen—are mixed, Protestantism prevailing in the first two, and Roman Catholicism in the last. There are also 16 polytechnic institutions; 787 gymnasia, realschulen, &c.; numerous special schools of technology, agriculture, forestry, mining, commerce, military science, &c.; several seminaries for teachers, and for the ministers of different religious denominations; and nearly 60,000 elementary schools. The attendance of children at school, for at least four or five years, is made compulsory in nearly all the German states, and hence the proportion of persons who cannot read and write is exceedingly small. Among the military recruits of 1887–88 only 0·71 per cent. were unable either to read or write. In East Prussia the percentage was 4·16—the highest in the empire. In all the other states, except Mecklenburg-Schwerin (1·27), the number of illiterate recruits was less than 1 per cent. Several of the smaller states had no recruits unable to read and write.

Public libraries, museums, botanical gardens, art-collections, picture-galleries, schools of music and design, and academies of arts and sciences are to be met with in most of the capitals, and in many of the country towns, upwards of 200 of which possess one or more permanently established theatres. In no country is the book and publishing trade more universally patronised than in Germany, where the chief centres are Leipzig and Stuttgart. The press annually sends forth from 8000 to 10,000 works, while about 3000 papers and journals are circulated throughout the empire. Of the current newspapers a comparatively small number only exert any marked influence, but many of the German scientific and literary periodicals enjoy a world-wide reputation (see BOOK-TRADE, Vol. II. page 315). The censorship of the press was abolished by a decree of the diet of 1848, and freedom of the press, under certain restrictions which were promulgated in 1854, has been introduced.

Religion. In regard to religion, it may be stated generally that Protestantism predominates in the north and middle, and Roman Catholicism in the south, east, and west, although very few states exhibit exclusively either form of faith. The Protestants belong chiefly either to the Lutheran confession, which prevails in Saxony, Thuringia, Hanover, and Bavaria east of the Rhine, or to the Reformed or Calvinistic Church, which prevails in Hesse, Anhalt, and the Palatinate. A union between these two churches has taken place in Prussia. There are six Roman Catholic archbishopries and eighteen Roman Catholic bishopries in Germany.

The following is the proportion of the different denominations, according to the census of 1885:

	Protestant	Roman Catholic	Other Christians	Jews	Persons of other or no religion
Prussia	18,144,305	9,041,763	82,030	366,776	5,047
Bavaria	1,521,114	3,839,440	5,731	53,697	217
Saxony	2,965,984	87,750	10,364	4,120	307
Würtemberg	1,478,216	508,420	5,442	13,171	137
Baden	490,427	1,004,488	5,447	25,104	113
Hesse	644,881	278,400	8,040	20,114	161
Mecklenburg-Schwerin	605,941	4,282	581	1,844	75
Oldenburg	294,399	74,393	1,180	1,620	28
Thuringian States	1,157,393	29,073	1,371	3,503	134
Lippe-Detmold	121,877	2,253	3,242	1,853	1,870
Other States	805,347	23,975	965	1,702	100
Alsace-Lorraine	312,941	1,210,325	3,771	36,876	442
Total	29,369,847	16,785,734	125,673	563,172	11,278
Per cent.	62·68	35·82	0·27	1·2	03

Judicial System.—In terms of the Judicature Acts of 1877 and 1878, a uniform system of law-courts was adopted by the different states in 1879. The appointment of the judges and the arrangement of the courts are left in the hands of the individual federal states, except in the case of the *Reichsgericht*. The *Amtsgericht*, with one judge, is competent for civil cases not involving more than £15 value, and for various minor offences. More important criminal cases are tried by the *Schoffengericht*, in which two *Schoffen* (assessors), chosen by rotation from among the qualified private citizens, sit with the judge. It deals with crimes whose punishment is not more than three months' imprisonment or a fine of £30, and with theft, fraud, &c., in which the damage is not more than 25s. Above these is the *Landgericht*, divided into civil and criminal chambers (*Kammern*), and consisting of a president, directors (who preside over the chambers), and ordinary members. In connection with the Landgericht, jury-courts (*Schwurgerichte*) are periodically held to try the more serious cases. These consist of three judges and twelve jurymen. A concurrent jurisdiction with the Landgericht in commercial matters is possessed by the chambers for commercial cases (*Handelssachen*), in which a judge sits as president along with two arbiters (*Handelsrichter*) appointed for three years from among the qualified citizens. A revising jurisdiction over the courts below is possessed by the *Oberlandesgericht*, which is divided into civil and criminal *senates*, each of

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which must contain four councillors and a president. The supreme court of appeal for the whole empire is the *Reichsgericht* at Leipzig, to which appeals lie even from the jury-trials. It possesses an original jurisdiction in the case of treason against the empire. It also is divided into civil and criminal senates, with a general president, senate-presidents, and councillors, appointed by the emperor on the recommendation of the Bundesrath. Seven members are required to be present in order to give a valid decision in any of the senates; and in the *plenum* one-third of the members must be present.

The penal and commercial codes are now uniform throughout Germany; but the Code Civil is still administered in Alsace-Lorraine and Rhenish Prussia, the Prussian land laws in the greater part of Prussia, and German common law in Saxony, parts of Prussia, Bavaria, &c.

Army.—In 1871 the Prussian military system was extended to the whole empire; alterations were introduced in 1888 and 1893. The Army Act of 1893 raised the annual levies by about 60,000 men, and reduced the term of service with the colours from three to two years for the infantry, that for cavalry and horse artillery remaining three years as before. About 400,000 young men annually reach the age of twenty, and, deductions made for physical unfitness, &c., about 360,000 are annually available—more than is required in all cases by the legal limitations. The required numbers are obtained by lot, the rest serve twelve years in the Ersatz, a kind of reserve. By the regulations in force, every German who is capable of bearing arms must be in the standing army for six years (generally his twenty-first to his twenty-seventh year). Two years must be spent in active service and the remainder in the army of reserve. He then spends five years in the first class of the Landwehr (q.v.), after which he belongs to the second class till his thirty-ninth year. Besides this, every German, from seventeen to twenty-one and from thirty-nine to forty-five is a member of the Landsturm, a force only to be called out in the last necessity. Those who pass certain examinations require to serve only one year with the colours, and are known as 'volunteers.' The land forces of the empire form a united army under the command of the emperor in war and peace. The sovereigns of the principal states have the right to select the lower grades of officers; but even their selections require to obtain the approval of the emperor, whose authority is paramount. The imperial army is divided into 19 army corps (besides the Prussian Guards and the Hessian division), and on the peace footing of 1899–1900 contained 23,230 officers, 562,266 rank and file, and 98,038 horses. There are 215 regiments of infantry, with 19 battalions of *jäger* or riflemen; 93 regiments of cavalry; 60 regiments of artillery; besides corresponding numbers of engineers and other non-combatants. On its war footing the total is about 3,000,000 men, besides the Landsturm. The cost of the army for 1899 was £25,900,000.

Navy.—The formation of a German navy, due to the initiative of Prussia, dates from 1848, and of late years rapid progress has been made. In 1889 the fleet consisted of 77 vessels, while in 1900 there were 194, 16 being battle-ships, 19 coast-defence armoured ships, 13 cruisers of the second and third class, 8 torpedo-gunboats, 35 torpedo-boats of the first class and 103 of the second and third class. Six battle-ships and 2 cruisers are building, while no less than 40 battle-ships, 8 coast-defence ships, 68 cruisers, and 114 torpedo-boats are projected. The *personnel* for 1900 consisted of 19,000 seamen and boys, 6312 warrant and petty officers, and 1118 officers. The seafaring population of Germany are liable to service in the navy instead of in the army. They are estimated at 80,000, of whom 48,000 are serving in the merchant navy at home, and about 6000 in foreign navies. After three years' active service, four years are spent in the naval reserve and five more in the first class of the *Seewehr*, those who have not served in the navy forming the second class. The empire has two ports of war: Kiel (q.v.), and Wilhelmshaven (q.v.) in the North Sea; and the ships are divided into the Baltic and North Sea stations, transference from one force to the other being facilitated by the Kaiser Wilhelm Canal from Kiel to the Elbe (see BALTIC SEA).

Revenue.—The revenue of the German empire is derived (1) from the customs dues on tobacco, salt, and beet-root sugar, which are entirely made over to it by all the states; from those on brandy and malt, which are also assigned by most of the states; from taxes on playing-cards and stamps, from posts, telegraphs, and railways, the imperial bank, and various miscellaneous sources; (2) from extraordinary sources —as votes for public buildings and loans; and (3) from the proportional contributions (*Matrikular-beiträge*) of the various states. The chief items of expenditure are the maintenance of the Reichstag and various government offices, the army and navy, posts and telegraphs, railways, justice, pensions, and other miscellaneous claims. The average income for the five years 1881–82 to 1885–86 was £30,121,470, and the average expenditure £30,564,200. In 1891-96 the revenue increased from £54,573,000 to £58,919,700; in 1894-95 the expenditure was £64,327,000, in 1895-96 £61,962,500. In 1894-95 the total funded debt of the empire, £95,785,700—partly at 3 and partly at 4 per cent. There is also an unfunded debt of £60,000,000. Against this there are large invested funds, as £22,800,000 of a invalid fund; while the war treasure of £6,000,000 is kept in gold at Spandau. The 'matricular' contributions of the several states amounted in all to £17,842,115 in 1895; of which Prussia paid £11,659,000, Saxe-Weimar only £126,900.

Social Organisation.—All the states of the empire recognise four distinct orders—viz. the nobility, clergy, burghers, and peasantry, and all distinguish three distinct grades of nobility. The highest of these includes the members of reigning houses, and the descendants of families who belonged at the time of the old empire to the sovereign nobility of the state, and were *reichsunmittelbar*, or directly connected with the empire, as holding their domains directly under the emperor, but whose houses have subsequently been *mediatised*, or deprived of sovereign power in accordance with special treaties between the state and the princes. There are at present fifty princely and fifty-one *grafliche* (county) mediatised families, who, in accordance with the act of the diet of 1806, have equality of rank with reigning houses, and enjoy many of the special privileges which were accorded to the high nobles of the empire. The second grade of nobility is composed of counts and barons not belonging to reigning or mediatised houses, whilst the third and lowest grade includes the knights and hereditary patrimonial proprietors of Germany.

Before we proceed to consider the political organisation of the new German empire, we shall briefly describe—(1) the principal features of the constitution of the old Germanic empire, which was overthrown by the first Napoleon in 1806; and (2) that Bund or federal government which lasted from 1815 to 1866, when Austria was excluded from the Confederation, and the hegemony of Germany was transferred to Prussia.

The Old Germanic Empire.—The states of this empire comprised three chambers or colleges: (1)

The Electoral College, which consisted of the archi episcopal electors of Mainz, Treves, and Cologne, and the secular electors, of whom there were originally only four, but whose number was subsequently increased to five, and who at the dissolution of the empire were represented by the sovereigns of Bohemia, Bavaria, Saxony, Brandenburg, and Brunswick-Lüneburg or Hanover (see ELECTORS). (2) The College of the Princes of the Empire, who had each a vote in the diet, and were divided into spiritual and temporal princes. (3) The Free Imperial Cities, which formed a college at the diet, divided into two benches, the Rhenish with fourteen cities, and the Swabian with thirty-seven; each of these had a vote. These colleges, each of which voted separately, formed the diet of the empire. When their respective decisions agreed, the matter under discussion was submitted to the emperor, who could refuse his ratification of the decisions of the diet, although he had no power to modify them. Ordinary meetings were usually summoned twice a year by the emperor, who specified the place at which the sittings were to be held; during the later periods of the empire they were held at Regensburg (Ratisbon). The diet had the right to enact, abrogate, or modify laws, conclude peace and declare war, and impose taxes for the general expenses of the state. The Aulic Chamber, and the Cameral or chief tribunal of the empire, decided in cases of dispute between members of the diet. The emperors were chosen by the electors in person or by their deputies; and after their election and coronation, which usually both took place at Frankfort on the Main, the emperor swore to the 'capitulation' or constitution of the empire. After the dissolution of the empire in 1806, its place was nominally taken by the Confederation of the Rhine, which owed its existence to Napoleon, and which lasted till 1815.

Germanic Confederation.—The Germanic Confederation was established by an act of the Congress of Vienna in 1815, on the overthrow of Napoleon. It was an indissoluble union, from which no single state could at its own pleasure retire. Its central point and its executive and legislative powers were represented by the federative diet, which held its meetings at Frankfort-on-the-Main, and was composed of delegates from all the confederate states, chosen, not by the people, but by the various governments. The diet deliberated either in a limited council (the Federative government) or as a general assembly (*Plenum*). In the limited council there were seventeen votes, of which eleven of the principal states had each one, while the remaining states divided the six collective votes between them. The Plenum, which met only when any organic change was to be effected in the diet itself, embraced seventy votes, of which Austria and the five German kingdoms had each four, while the other states had three, two, or one vote each in proportion to their individual importance. It rested with the limited council, which executed the enactments of the Plenum, and despatched the ordinary business of the Confederation, to decide (by a majority of voices) whether a question should be submitted to the Plenum, where it was not debated, but simply decided by a majority of ayes or noes. Austria presided in both assemblies, and had a casting vote in cases of equality. The diet, as a collective body, had the right of concluding peace and alliances, and declaring war; but this power could only be exercised for the maintenance of the independence and external security of Germany and the individual integrity of the several federative states, which on their part were bound to submit to the diet the consideration of all questions in dispute between themselves and other powers. Where such differences could not be settled by the committee empowered by the Plenum to consider them, they were finally referred to a special tribunal known as the 'Austrägal' Court, which was composed of several members of the Confederation invested for the time with full powers. From 1866 to 1871 the place of this Bund was held by the North German Confederation, which is described in the historical part of this article.

Present German Empire.—The seventy-ninth article of the constitution of the North German Confederation provided for the admission of the South German states into the new Bund; and the war between France and Germany, which broke out in July 1870, and in which all the German princes and peoples took part, gave an irresistible impetus to the desire for national unity. On the 15th November 1870 the grand-duchies of Baden and Hesse joined the Bund; Bavaria followed on the 23d, and Würtemberg on the 25th of the same month. Shortly after, the king of Bavaria wrote a letter to the king of Prussia, urging him to re-establish the German empire. This brought the question under the notice of the Bund; and on the 10th December 1870 it was agreed, by 188 votes to 6, that the empire should be restored, and that the king of Prussia should be acknowledged hereditary German emperor. The latter solemnly accepted the new dignity at Versailles, 18th January 1871.

The constitution for the new empire was promulgated by an imperial decree of April 16, 1871, and is contained in seventy-eight articles, under fourteen sections. Alsace and Lorraine were brought under its provisions from January 1, 1874. The preamble expressly declares that all the states of Germany form an eternal union for the protection of the territory of the Bund, and for the care of the welfare of the German people. The empire possesses the exclusive right of legislation on all military and naval affairs; on civil and criminal law for general application; on imperial finance and commerce; on posts, telegraphs, and railways in so far as the interests of the national defence and general trade are concerned. Wherever the laws of the empire come into collision with those of particular states of the Bund, the latter must be held as abrogated; and in all disputes that arise among the individual states, the imperial jurisdiction is supreme and final.

There are two legislative bodies in the empire—the *Bundesrath*, or Federal Council, the members of which are annually appointed by the governments of the various states; and the *Reichstag*, the members of which are elected by universal suffrage and ballot for a period of three years. The former deliberates on proposals to be submitted to the latter, and on the resolutions received from it. A simple majority is sufficient to carry a vote in the Bundesrath. Acting under the direction of the chancellor of the empire, the Bundesrath, in addition to its legislative functions, represents also a supreme administrative and consultative board, and, as such, has eleven standing committees—viz. for the army and fortresses; naval matters; tariff, excise, and taxes; trade and commerce; railways, posts, and telegraphs; civil and criminal law; financial accounts; foreign affairs; Alsace-Lorraine; matters affecting the constitution; and the arrangement of business. Each committee consists of representatives of at least four states of the empire, besides the president; but the foreign affairs committee includes the representatives of the kingdoms of Bavaria, Saxony, and Würtemberg, and of two other states annually selected by the Bundesrath.

The Reichstag contains approximately one member for every 120,000 inhabitants; in 1889 there

were 397 members. The Reichstag must be convened annually, but cannot be assembled unless the Bundesrath is also in session. Its proceedings are public; the members are unpaid, but enjoy various privileges and immunities. A dissolution of the Reichstag before the end of three years requires the consent of the Bundesrath; and the new election must take place within sixty days, and the meeting of the new Reichstag within ninety days after the dissolution. By a law passed in 1888, to come into force in 1890, the legislative period has been increased to five years. The Reichstag elects its own president. The members of the Bundesrath may claim a right to speak in the Reichstag; but no one can be a member of both assemblies at once. All imperial laws must receive the votes of an absolute majority of both bodies, and, to be valid, must, in addition, have the assent of the emperor, and be countersigned when promulgated by the *Reichskanzler*, or chancellor of the empire, who is appointed by the emperor, and is *ex officio* president of the Bundesrath.

The votes in the two assemblies are apportioned as follows: Prussia has 17 votes in the Bundesrath and 236 in the Reichstag; Bavaria has respectively 6 and 48; Wurtemberg, 4 and 17; Saxony, 4 and 23; Baden, 3 and 14; Mecklenburg-Schwerin, 2 and 6; Hesse, 3 and 9; Oldenburg, Saxe-Weimar, and Hamburg, each 1 and 3; Brunswick, 2 and 3; Saxe-Meiningen, Saxe-Coburg-Gotha, and Anhalt, 1 and 2; and the remainder 1 vote in each assembly. Alsace-Lorraine has 15 votes in the Reichstag, but in the Bundesrath is represented only by 4 commissioners (*Kommissäre*) without votes, appointed by the Statthalter. To assist the Reichskanzler in managing imperial affairs, a number of offices (not ministries) have developed in the course of time for the different departments of state.

According to the eleventh article of the constitution, the German emperor, with the consent of the Bundesrath, can declare war, make peace, enter into treaties with foreign nations, and appoint and receive ambassadors. If, however, the territory of the empire is attacked, he does not require the consent of the Bundesrath to declare war, but can act independently. Changes in the constitution can be effected only by imperial law, and they are held to be rejected if 14 votes are given against them in the Bundesrath.

Political Parties.—There is no imperial responsible ministry in Germany, and the government is independent of changes in the relative strength of the various parties in the Reichstag. For years Prince Bismarck formed alliances now with this, now with that party, according to the aim he had in view; and his opponents, even when they defeated his measures, had no thought of superseding him in the chancellorship. The chief political parties in the Reichstag may be roughly grouped under the names Liberal, Conservative, and Clerical. Of the first, the *National Liberals*, a party dating from the crisis of 1866, whose object is a united Germany on constitutional lines, were long the most influential supporters of Bismarck. In 1879, however, they differed from him on the questions of the new protectionist and military policies; and in consequence they suffered a severe defeat at the next election. The advanced wing of the Liberal party, known as the *Fortschrittspartei*, formed a coalition in 1884 with a considerable number of 'Secessionists' from the National Liberals, and founded the present *Deutsch-Freisinnige-partei*, under the leadership of Eugen Richter, with a radical programme including demands for a responsible ministry, annual budgets, freedom of speech, meeting, and press, and payment of members. The reorganised National Liberal party once more approached Bismarck, and, having in 1888 joined the Conservatives in support of the government measures, now forms part of the so-called *Cartellpartei*, or Coalition party. The Conservatives include the *Deutsche Konservativen*, a distinctly reactionary group, and the *Deutsche Reichspartei* or *Frei-Konservativen*, best perhaps described as Liberal-Conservatives, aiming at a fair imperial government as the first necessity of their country. The *Centre* or Ultramontane party, organised by Windthorst since 1871, is essentially the Roman Catholic clerical party, and has offered the most determined and best-organised resistance to Bismarck. A temporary alliance, however, with this party enabled the chancellor to carry his protectionist proposals in 1889. The *Elsasser*, the French party of Alsace, generally vote with the Centre. Among the smaller parties the most significant is that of the *Social Democrats*, who, in spite of all the hostile socialist legislation, rose from 2 votes in 1871 to 48 in 1897. The smaller parties, with special and more private views, are known as *Particularisten;* they include the *Poles*, aiming at the separation of Polish Prussia from Germany, *Welfen*, or Hanoverian royalists, and some individual members. In 1890 the National Liberals had 41 votes as against 91 in 1887; the Imperialists or New Conservatives, 20 instead of 38; the Centre, 117 for 101; the Social Democrats, 35 for 11; the Freisinnige, 66 for 36.

See *Statistik des Deutschen Reichs*, published periodically by the Imperial Statistical Office, and the *Statistisches Jahrbuch* (annually since 1880). The Jahrbuch for 1889 contains an index to the Statistik since 1871. Kutzen, *Das Deutsche Land* (3d ed. 1880); Berghaus, *Deutschland und seine Bewohner* (2 vols. 1880); Daniel, *D. nach seinen physischen und politischen Verhältnissen* (2 vols. 5th ed. 1878); Delitsch, *Forschungen zur D. Landes- u. Volkskunde* (1885); Neumann, *Das Deutsche Reich in Geog., Statist., und Topograph. Beziehung* (1872-74), and *Geog. Lexikon des D. Reichs* (1883); S. Baring-Gould, *Germany, Past and Present* (2 vols. 1881); Baedeker's Travellers' Handbooks; and the *Handbuch für das Deutsche Reich*, Kutschner's *Staatshandbuch*, the *Statesman's Year-book*, and the *Almanach de Gotha* for the current year. On the Constitution, Stork's *Handbuch der Deutschen Verfassung* (1884).

History.—The earliest information we have of the Germans, the peoples and tribes who dwelt among the dense forests that stretched from the Rhine to the Vistula and from the Danube to the Baltic Sea, comes to us from the Romans, the principal authority being Tacitus. The term Germans is of Celtic origin, though its meaning is not precisely known. It was in all probability borrowed by the Romans from the Gauls. The Germans were not one homogeneous nation, but a multitude of separate and independent tribes, who had racial origin, language, and similarity in their mode of life for their only links of connection. The first tribes of Germanic race to come into collision with the arms of Rome were the Cimbri and Teutones, who in 113 B.C. had invaded Styria, and there met with defeat from the troops of the consul Papirius. The next Roman general who made trial of their prowess was Cæsar. When in 58 B.C. he began his campaigns in Gaul, he found several hordes of Germans, mostly Marcomanni and Suevi, settled between the Rhine and the Vosges, and even on the western side of these hills. Appealed to by the Gauls of those regions to free them from their German oppressors, Cæsar, in spite of the redoubtable stature and strength of his enemies, and of their personal valour, inflicted a crushing defeat upon their ambitious chieftain, Ariovistus, and chased him and his followers across the Rhine. Then, continuing his campaign, he drove back (55 B.C.) behind the same river those tribes that had settled on its western side in

Belgium, and even followed them into their original seats in Germany in two short campaigns. The tranquillity which was established through his exertions was, however, so seriously disturbed again by 15 B.C. that Augustus felt it necessary to make a serious effort to subjugate these troublesome neighbours of Gaul. Accordingly Drusus was sent (12 B.C.) at the head of eight legions across the frontier; and in four campaigns he was so far successful that he subdued the Batavians, Frisians, and other tribes as far as the Elbe, and likewise the Chatti on the Main. After the death of Drusus in 9 B.C. Tiberius conquered the Tencteri and Usipetes, who lived on the middle Rhine, and afterwards the Sicambri and others settled on the lands at its mouth. In 6 A.D. the work was taken up by Varus; but Varus, in attempting to consolidate the Roman power by depriving the Germans of their national institutions and imposing upon them those of the empire, provoked a general revolt of the subject peoples. The animating spirit of this patriotic movement was Arminius (q.v.), chief of the Cherusci, who not only overthrew Varus, and slew him and his legions (9 A.D.) at one blow in the Teutoburg Forest, but with irresistible *élan* swept the Romans before him until he had expelled them from German soil. The struggle was renewed by Germanicus, who defeated Arminius and avenged the Roman honour, but at length, in 16 A.D., withdrew his legions. Henceforth the Romans contented themselves with guarding their long frontier next Germany; and in this task they succeeded for some time as much by stirring up dissension amongst the chiefs of their foemen as by their own military skill. Yet they managed to bring the Frisians and Batavians under their influence, until in 69 a fierce revolt broke out amongst the latter people, a revolt which was only quelled after a terrible struggle. About one hundred years later the Germans began to reverse the order of things. In the period 166–174 Aurelius was engaged in beating back a formidable incursion of the Marcomanni and Quadi into Roman territory. From the 3d century we no longer read of single tribes, but of great confederations of tribes, as the Goths, Alemanni, Franks, Frisians, Saxons, Thuringians, and others. These powerful combinations began to harass the Romans all along their frontier line, from the mouth of the Rhine to the middle Danube, attacking the towns and forts, and breaking down the walls they had built to keep this boundary. In 375 began the movement before which Rome eventually succumbed. The Huns invaded Europe, and by their coming gave rise to what is known as the 'Volkerwanderungen' or 'Migrations of the Peoples.' The races who lay next to Roman territory were being pressed upon more and more by those behind, upon whom the full brunt of the Hunnic attack had fallen, and at last they began to pour across the boundary in such broad deep streams that the dams of the Romans were broken completely down before their onrush. Of the history of Germany itself we learn little more that is authentic until we come down to the times of the Franks, except that the Slavic nations following in the wake of the Huns seized and occupied the lands left vacant by the German emigrants who had gone Romewards, and that of the confederations still remaining at home in their original lands the most important were the Alemanni, the Thuringians, Saxons, Bavarians, and Franks. The historian turns his attention more especially towards the last-named, since by them the kingdoms of France and Germany were subsequently formed. See FRANCE, and FRANKS.

After the gradual expulsion or retirement of the Romans from Germany, the country necessarily became subdivided into numerous petty states, each governed by its own chief. The erection of the Franko-Merovingian empire in France had given preponderance to the Frankish power on both sides of the Rhine, and when Charlemagne succeeded in 771 to the German as well as the Gallic possessions of his father, Pepin the Short, he found himself possessed of an amount of territory and a degree of influence which speedily enabled him to assert supremacy over the whole of the west of Germany, while his conquests over the heathen Saxons in the north, and the Avars who then held Pannonia in the south-east, extended his German dominions from the North Sea to the Alps, and from the Rhine as far as Hungary. With Charlemagne, who received the imperial crown at the hands of the pope in 800, began the long line of emperors and kings who occupied the German throne for more than a thousand years; and with him, too, ended the stability of the vast fabric which he had reared on the ruins of Roman power, for at his death in 814 no member of his family was competent to wield the imperial sceptre. Although in 843 some portions of his German possessions fell, in accordance with the treaty of Verdun, to his grandson Ludwig, surnamed 'the German,' who was recognised as king of Germany or East Francia, the final and absolute partition did not take place till 887, when Arnulf seized the eastern throne. On the extinction, in 911, of the degenerate Carlovingian dynasty in the person of Ludwig 'the Child,' the provincial rulers, who, together with the archbishops, bishops, and abbots, constituted the chief members of the diet or national assembly, arrogated to themselves (in imitation of the practice of the nobles of the ancient German tribes) the right of electing their sovereign, who, however, could not assume the imperial title till he had been crowned by the pope. At this period there were in Germany five nations—the Franks, Saxons, Bavarians, Swabians, and Lorrainers. The Franks, as the descendants of those who had conquered the land and founded the empire, enjoyed a pre-eminence over the others; and hence, on the extinction of the Carlovingian race, the choice of the prince-electors seems to have fallen almost as a matter of course on the chief of the Franks, the Duke of Franconia, who reigned as king of Germany from 911 to 918, under the title of Conrad I. At his own instigation, his rival and adversary, Henry, Duke of Saxony, was chosen as his successor, and proved himself an able and warlike prince. The conquests of this great prince over the Danes, Slavs, and especially over the terrible Magyars, were confirmed and extended by his son and successor, Otho I. (936–973), who carried the boundaries of the empire beyond the Elbe and Saale, and who, by his acquisition of Lombardy, laid the foundation of the relations which existed for many ages between the rulers of Germany and the Italian nation. Otho's coronation-festival was eventful, as it formed the precedent for the exercise of those offices which, till the dissolution of the empire, were regarded as connected with the dignity of the secular electors; for on that occasion, while the emperor dined with his three spiritual electors, he was waited upon by the secular princes—the Elector of Bavaria (afterwards of Saxony) serving as grand-marshal; of Swabia (afterwards of Bohemia), as grand-cupbearer; and of Lorraine (afterwards of Brandenburg), as arch-chamberlain.

Otho II. (973–983), Otho III. (983–1002), and Henry II. (1002–24) belonged to the House of Saxony, which was succeeded by that of Franconia, in the person of Conrad II. (1024–39), an able ruler, who added Burgundy to the empire. His son and successor, Henry III. (1039–56), tempo-

rarily extended German supremacy over Bohemia, Denmark, and Hungary, while he repressed the insolence and despotism of the great nobles of Germany. And while his stern piety moved him to interfere with force in the strife over the papal chair, he also gained the respect of his contemporaries by his zeal for justice and his valour in the field. The minority of his son and successor, Henry IV. (1056–1106), enabled the nobles to recover much of their former power, and to apply a check to the further consolidation of the imperial authority, which had been considerably extended under the two preceding reigns. Henry's constant quarrels with the astute Gregory VII. entangled him in difficulties and mortifications, which culminated in his humiliation at Canossa, and only ended with his life, and which plunged Germany into anarchy and disorder. The emperor's most formidable rival, Rudolph of Swabia, was defeated and slain in 1080. With his son and successor, Henry V. (1106–25), who made peace with the papacy by the Concordat of Worms in 1122, the male line of the Franconian dynasty became extinct; and after the crown had been worn (1125–37) by Lothair of Saxony, who made a bold attempt to recover some of the prerogatives of which at his election the empire had been deprived through papal intrigues, the choice of the electors, after a season of dissension and intrigue, fell upon Conrad III. (1138–52), Duke of Franconia, the first of the Hohenstaufen dynasty. His reign, in which the civil wars of the Guelphs (q.v.) and Ghibellines began, was distracted by the dissensions of the great feudatories of the empire, while the strength of Germany was wasted in the disastrous Crusades, in which Conrad took an active part. On his death the electoral college for the first time met at Frankfort, which retained the honour of being the place at which the sovereign was elected and crowned till the dissolution of the empire in the 19th century. Frederick I. (1152–90), surnamed Barbarossa, Duke of Swabia, was, at the recommendation of his uncle Conrad, chosen as his successor, and the splendour of his reign fully warranted the selection. By the force of his character Frederick acquired an influence over the diets which had not been possessed by any of his immediate predecessors, and during his reign many important changes were effected in the mutual relations of the great duchies and counties of Germany, while we now for the first time hear of the *hereditary* right possessed by certain princes to exercise the privilege of election. Unfortunately for Germany, this great monarch suffered the interests of his Italian dominions to draw him away from those of his own country, whilst his participation in the Crusades, in which both he and the flower of his chivalry perished, was only memorable for the misfortunes which it entailed on the empire. The interval between the death of Frederick Barbarossa (1190) and the accession of Rudolf I. (1273), the first of the Hapsburg line, which, through a female branch, still reigns in Austria, was one of constant struggle, internal dissension, and foreign wars. Individually, the princes of the Hohenstaufen dynasty were popular monarchs, their many noble and chivalrous qualities having endeared them to the people, while one of the race, Frederick II. (1212–50), was, after Charlemagne, perhaps the most remarkable sovereign of the middle ages; but their ambitious designs on Italy, and their constant but futile attempts to destroy the papal power, were a source of misery to Germany, and with Frederick II. ended the glory of the empire, till it was partially revived by the Austrian House of Hapsburg. His son, Conrad IV. (1250–54), with whom the Hohenstaufen line ended in Germany, was succeeded, after a brief and troubled reign, by various princes, who in turn, or in some cases contemporaneously, bore the imperial title without exercising its legitimate functions or authority. This season of anarchy (known as the Great Interregnum) was terminated at the accession of Rudolf I. (1273–91), who, by the destruction of the strongholds of the nobles, and the stringent enforcement of the laws, restored order. His chief efforts were, however, directed to the aggrandisement of his Austrian possessions, which embraced Styria, Carinthia, Carniola, and Tyrol.

For the next 200 years the history of the German empire presents very few features of interest, and may be briefly passed over. Adolf of Nassau, who was elected to succeed Rudolf, was compelled in 1298 to yield the crown to the son of the latter, Albert I. (1298–1308), whose reign is chiefly memorable as the period in which three Swiss cantons, Unterwalden, Schwyz, and Uri, established their independence. After the murder of Albert the throne was occupied in rapid succession by Henry VII. (1308–13), who added Bohemia to the empire, and, conjointly, by Frederick III. of Austria and Ludwig IV. of Bavaria (1313–47). Charles IV. (1347–78) of Luxemburg was the successful candidate among many rivals; and, although he attended specially to the interests of his hereditary possessions of Bohemia, Moravia, Silesia, and Lusatia, he did not entirely neglect those of the empire, for which he provided by a written compact, known as the *Golden Bull* (1356), which regulated the rights, privileges, and duties of the electors, the mode of the election and coronation of the emperors, the coinage, customs, and commercial treaties of the empire, and the rights and obligations of the free cities. His son, Wenceslaus (1378–1400), who was finally deposed, brought the royal authority into contempt, from which it was scarcely redeemed by Rupert of the Palatinate (1400–10). The nominal reign of Sigmund (1410–37), the brother of Wenceslaus, would demand no notice were it not for his connection with the Council of Constance in 1414, at which Huss was condemned, and which was followed by the disastrous Hussite wars. The readiness with which Sigmund lent himself to the interests of Henry V. of England, and of all other princes who ministered to his love of personal display, brought discredit on the imperial dignity, while his dishonourable desertion of Huss will ever attach ignominy to his name. Albert II. of Austria (1438–39), after a reign of less than two years, in which he gave evidence of great capacity for governing, was succeeded by his cousin, Frederick IV. (1440–93), an accomplished but avaricious and indolent prince, whose chief object seemed to be the aggrandisement of the House of Hapsburg, with which the title of emperor had now become permanently connected (see AUSTRIA), while he neglected the interests of Germany collectively, and suffered the Turks to make unchecked advances upon its territory. Maximilian I. (1493–1519), the son and successor of Frederick, resembled him in few respects, for he was active, ambitious, and scheming, but deficient in steadiness of purpose. His marriage with Mary, the rich heiress of her father, Charles the Bold of Burgundy, involved him in the general politics of Europe, while his opposition to the reformed faith preached by Luther exasperated the religious differences which disturbed the close of his reign. Maximilian had, however, the merit of introducing many improvements in regard to the internal organisation of the state, by enforcing the better administration of the law, establishing a police and an organised army, and introducing a postal system. With him originated, moreover, the special courts of jurisdiction known as the

'Imperial Chamber' and the 'Aulic Council:' and in his reign the empire was divided into ten circles, each under its hereditary president and its hereditary prince-convoker. Maximilian lived to see the beginning of the Reformation, and the success that attended Luther's preaching; but the firm establishment in Germany of the reformed faith, and the religious dissensions by which its success was attended, belong principally to the reign of his grandson, Charles I., king of Spain, the son of the Archduke Philip and of Joanna, the heiress of Spain, who succeeded to the empire under the title of Charles V. (1519–56). The management of his vast possessions in Spain, Italy, and the Netherlands, and the wars with France, in which he was so long implicated, diverted him from his German territories, which he committed to the care of his brother Ferdinand. The princes of Germany were thus left to settle their religious differences among themselves, and to quell, unaided by the head of the state, the formidable insurrection of the peasants (1524–25), which threatened to undermine the very foundations of society, and which had followed close upon the nobles' war (1522–23), raised by Ulrich von Hutten and Francis von Sickingen in the vain hope of securing a more united Germany under the emperor. The rising of the lower orders was due to the preaching of the fanatic Münzer, and other leaders of the sect of Anabaptists (q.v.), which had arisen from a perverted interpretation of some of the tenets advanced by Luther. Charles's determined opposition to the reformers rendered all settlement of these religious differences impracticable; and although, by the aid of his ally, Maurice of Saxony, he broke the confederation of the Protestant princes known as the League of Schmalkald, he was forced by his former ally to sign the peace of Augsburg in 1555, which granted tolerance to the Lutherans; and, in his disgust at the complicated relations in which he was placed to both parties, he abdicated in favour of his brother Ferdinand (1556–64), who put an end to much of the religious dissension that had hitherto distracted the empire, by granting entire toleration to the Protestants. Although Ferdinand was personally mild and pacific, his reign was troubled by domestic and foreign aggressions—the different sects disturbing the peace of the empire at home, while the French and the Turks assailed it from abroad.

During the next fifty years the empire was a prey to internal disquiet. Maximilian II. (1564–76) was indeed a wise and just prince, but the little he was able to effect in reconciling the adherents of the different churches, and in raising the character of the imperial rule, was fatally counteracted by the bigotry and vacillation of his son and successor, Rudolf II. (1576–1612), in whose reign Germany was torn by the dissensions of the opposite religious factions, while each in turn called in the aid of foreigners to contribute towards the universal anarchy which culminated in the Thirty Years' War, begun under Rudolf's brother and successor Matthias (1612–19); continued under Ferdinand II. (1619–37), an able, but cruel and bigoted man; and ended under Ferdinand III. (1637–57), by the treaty of Westphalia, in 1648. The effect of the Thirty Years' War (q.v.) was to depopulate the rural districts of Germany, destroy its commerce, burden the people with taxes, cripple the already debilitated power of the emperors, and cut up the empire into a multitude of petty states, the rulers of which exercised almost absolute power within their own territories. Leopold I. (1658–1705), a haughty, pedantic man, did not avail himself of the opportunities afforded by peace for restoring order to the state, but suffered himself to be drawn into the coalition against France, whilst his hereditary states were overrun by the Turks, and were indebted for their safety to Sobieski, king of Poland. Although success often attended his arms, the cunning of Louis XIV. prevented peace from bringing the emperor any signal advantages; and it was in this reign that Strasburg was attached to the French empire. The reigns of Joseph I. (1705–11) and Charles VI. (1711–40), with whom expired the male line of the Hapsburg dynasty, were signalised by the great victories won by the imperialist general, Prince Eugene, in conjunction with Marlborough, over the French, in the war of the Spanish succession (1702–13). But the treaty of Utrecht (1713) brought no solid advantage to the empire. The disturbed condition of Spain and Saxony opened new channels for German interference abroad. Germany was further distracted, after the death of Charles, by the dissensions occasioned by the contested succession of his daughter, Maria-Theresa, who claimed the empire in virtue of the Pragmatic Sanction drawn up by her father in 1713, and through her of her husband, Francis I. of Lorraine, after their rival, the Bavarian Elector, Charles VII., had by means of Prussian aid been elected in 1742 to the imperial throne. Charles, however, was obliged to cede his crown after a brief occupation of three years. Constant disturbances, intensified during the Seven Years' War (1756–63), when Frederick the Great of Prussia maintained his character of a skilful general at the expense of the Austrians, made the reign of Francis I. (1745–65) one of trouble and disaster. Joseph II., his son (1765–90), during the lifetime of Maria-Theresa, who retained her authority over all the Austrian states, enjoyed little beyond the title of emperor, to which he had succeeded on his father's death. But when he ultimately acquired his mother's vast patrimony he at once entered upon a course of reforms, which were, however, premature, and unsuited to the cases to which they were applied; whilst his attempts to re-establish the supremacy of the imperial power in the south of Germany were frustrated by Prussian influence.

Leopold II., after a short reign of two years, was succeeded in 1792 by his son Francis II., who, after a series of defeats by the armies of the French Republic, and the adhesion, in 1805, of many of the German princes to the alliance of France, which led to the subsequent formation of the Rhenish Confederation under the protectorate of Napoleon, resigned the German crown, and assumed the title of Emperor of Austria. (See for further details AUSTRIA, NAPOLEON, FRANCE, PRUSSIA, and the articles on the other German states.) From this period till the Congress of Vienna of 1814–15 Germany was almost entirely at the mercy of Napoleon, who deposed the established sovereigns, and dismembered their states in favour of his partisans and dependants, while he crippled the trade of the country, and exhausted its resources by the extortion of subsidies or contributions. The second peace of Paris (1814) restored to Germany all that had belonged to her in 1792; and, as a reconstruction of the old empire was no longer possible, those states which still maintained their sovereignty combined, in 1815, to form a German Confederation. Of the 300 states into which the empire had once been divided there now remained only 39, a number which was afterwards reduced to 35 by the extinction of several petty dynasties. The diet was now reorganised, and appointed to hold its meetings at Frankfort-on-the-Main, after having been formally recognised by all the allied states as the legislative and executive organ of the Confederation; but it failed to satisfy the expectations of

the nation, and soon became a mere political tool in the hands of the princes, who simply made its decrees subservient to their own efforts for the suppression of every progressive movement. The festival of the Wartburg, and the assassination of Kotzebue, were seized as additional excuses for reaction; and though the French revolution of 1830 so influenced some few of the German states as to compel their rulers to grant written constitutions to their subjects, the effect was transient, and it was not till 1848 that the German nation gave expression, by open insurrectionary movements, to the discontent and the sense of oppression which had long possessed the minds of the people. The princes endeavoured by hasty concessions to arrest the progress of republican principles, and, fully recognising the inefficiency of the diet, they gave their sanction to the convocation, by a provisional self-constituted assembly, of a national congress of representatives of the people. Archduke John of Austria was elected Vicar of the newly-organised national government; but he soon disappointed the hopes of the assembly by his evident attempts to frustrate all energetic action on the side of the parliament, while the speedy success of the anti-republican party in Austria and Prussia damped the hopes of the progressionists. The refusal of the king of Prussia to accept the imperial crown which the parliament offered him in 1849 was followed by the election of a provisional regency of the empire; but as nearly half the members had declined taking part in these proceedings, or in a previous measure, by which Austria had been excluded, by a single vote, from the German Confederation, the assembly soon lapsed into a state of anarchy and impotence, which terminated in its dissolution. The sanguinary manner in which insurrectionary movements had in the meanwhile been suppressed by Prussian troops both in Prussia and Saxony put an effectual end to republican demonstrations; and in 1850 Austria and Prussia, after exhibiting mutual jealousy and ill-will which more than once seemed likely to end in war, combined to restore the diet, whose first acts were the intervention in Sleswick-Holstein in favour of Denmark, and the abolition of the free constitutions of several of the lesser states. From that period the diet became the arena in which Austria and Prussia strove to secure the supremacy and championship of Germany; every measure of public interest was made subservient to the views of one or other of these rival powers; and the Sleswick-Holstein difficulties were the principal questions under discussion in the federal parliament, down to the rupture between Prussia and Austria, and the dissolution of the Bund in 1866.

The immediate occasion of the war of 1866 was the difference that arose between Prussia and Austria, after the convention of Gastein (1865), as to the occupation and disposal of the territory taken from Denmark in the short war of 1864 (see SLESWICK). But the real grounds lay in that rivalry between the two states for the leadership of Germany, the germ of which is as old as the time of the Great Elector (see FREDERICK-WILLIAM), and which has shown itself at many epochs of their history. There can be little doubt that the feeling of the German people, as distinguished from the princes and bureaucracy, had, in recent times at least, been in favour of the purely German Prussia as their leader, rather than Austria. And when the parliament of Frankfort in 1849 offered the imperial crown to the king of Prussia, the unity of Germany might have been secured without bloodshed, had the monarch been less scrupulous, or had he had a Bismarck for his adviser. But that opportunity being let slip, and the incubus of the 'Bund' being restored, it became apparent that the knot must be cut by the sword.

By the treaty of Gastein Austria and Prussia agreed to a joint occupation of the Elbe duchies; but to prevent collision it was judged prudent that Austria should occupy Holstein, and Prussia Sleswick. Already a difference of policy had begun to show itself: Prussia was believed to have the intention of annexing the duchies; while Austria began to favour the claims of Prince Frederick of Augustenburg. In the meantime, both nations were making ready for the struggle; and Italy, looking upon the quarrel as a precious opportunity to strike a blow for the liberation of Venetia, had secretly entered into an alliance with Prussia.

In the sitting of the German diet, June 1, 1866, Austria, disregarding the convention of Gastein, placed the whole matter at the disposal of the Bund, and then proceeded to convoke the states of Holstein 'to assist in the settlement of the future destination of the duchy.' Prussia protested against this as an insult and a violation of treaty; demanded the re-establishment of the joint occupation; and, while inviting Austria to send troops into Sleswick, marched troops of her own into Holstein. Instead of responding to this invitation, Austria withdrew her forces altogether from Holstein, under protest; and then, calling attention to this 'act of violence' on the part of Prussia, proposed that the diet should decree 'federal execution' against the enemy of the empire. This eventful resolution was carried by a great majority on the 14th June 1866; Hanover, Saxony, Hesse-Cassel, and Hesse-Darmstadt voting for it. The resolution having passed, the Prussian plenipotentiary, in the name of his government, declared the German Confederation dissolved for ever, and immediately withdrew.

Thereupon identical notes were sent by Prussia to the courts of Saxony, Hanover, and Hesse-Cassel. The terms were not accepted, and the Prussian troops at once took military possession of the three kingdoms without resistance. War was now declared against Austria; the Prussian host, numbering in all 225,400 men, with 774 guns, invaded Bohemia at three several points. The Austrians, who had been surprised in a state of ill-organised unreadiness, had assembled an army of 262,400 men and 716 guns; and the greater portion of these were stationed, under General Benedek, behind the Riesengebirge, expecting the attack from Silesia. The Prussian armies meanwhile crossed the Erzgebirge without opposition, drove the Austrian army steadily and quickly back with heavy losses, and, after effecting a junction, moved steadily forward to meet the Austrian army, now concentrated between Sadowa and Königgrätz. Here, on July 3, was fought the decisive battle. The Austrian cavalry made heroic efforts to turn the tide of victory; but the stern trained valour of the Prussians, armed with the till then little known breech-loading 'needle-gun,' was invincible, and the Austrian army was broken and dissolved in precipitate flight. The Prussians lost upwards of 9000 killed and wounded; the Austrian loss was 16,235 killed and wounded, and 22,684 prisoners. After this decisive defeat, which is known as the battle of Königgrätz or Sadowa, all hope of staying the advance of the Prussians with the army of Benedek was at an end; a truce was asked for, but refused; and not till the victorious Prussians had pushed forward towards Vienna, whither Benedek had drawn his beaten forces, was a truce obtained through the agency of the emperor of the French, the peace of Prague (August 20). Italy (q.v.), though more than half-inclined to stand out for the cession by Austria of

the Trentino, as well as Venetia, reluctantly agreed to the armistice (August 12).

A brief campaign sufficed for the defeat of the minor states of Germany that had joined Austria—viz. Bavaria, Würtemberg, Baden, and Hesse-Darmstadt; and, after peace had at last been arranged, some of them were forced to submit to a certain loss of territory. Saxony only escaped incorporation with Prussia through the resolute opposition of Austria supported by France; but the little kingdom, like all the other states that had taken arms against Prussia, was forced to pay a heavy war indemnity. Even the little principality of Reuss had to pay 100,000 thalers into the fund for Prussian invalids. The states north of the Main which had taken up arms against Prussia were completely incorporated—viz. Hanover, Hesse-Cassel, Nassau, Frankfort, and a small portion of Hesse-Darmstadt, as well as Sleswick-Holstein and Lauenburg; and the other states north of the Main were united with Prussia in a confederacy of a more intimate nature than before existed, called the *North German Confederation*.

Austria, by the treaty of Prague (20th August 1866), was completely excluded from participation in the new organisation of the German states, and formally agreed to the surrender of Venetia to Italy, to the incorporation of Sleswick-Holstein with Prussia, and to the new arrangements made by Prussia in Germany. A portion of the fifth article of this treaty secured that, if the 'inhabitants of the northern districts of Sleswick declare, by a free vote, their desire to be united to Denmark, they shall be restored accordingly;' but this was withdrawn in 1878 by secret treaty between Austria and Germany. Though losing no territory to Prussia, Austria had to pay 40 millions of thalers for the expense of the war.

The North German Confederation, as thus constituted, possessed a common parliament, elected by universal suffrage, in which each state was represented according to its population. The first or constituent parliament met early in 1867, and adopted, with a few modifications, the constitution proposed by Count Bismarck. The new elections then took place, and the first regular North German parliament met in September 1867. According to this constitution, there was to be a common army and fleet, under the sole command of Prussia; a common diplomatic representation abroad, of necessity little else than Prussian; and to Prussia also was entrusted the management of the posts and telegraphs in the Confederation.

The southern German states which up to this point had not joined the Bund, were Bavaria, Baden, Würtemberg, Hesse-Darmstadt, and Liechtenstein, with a joint area of 43,990 sq. m., and a total population (1866) of 8,524,460. But, though these states were not formally members of the Bund, they were so practically, for they were bound to Prussia by treaties of alliance offensive and defensive, so that in the event of a war the king of Prussia would have at his disposal an armed force of upwards of 1,100,000 men.

During the next few years the North German Confederation was employed in consolidating and strengthening itself, and in trying to induce the southern states to join the league. The Zollverein (q.v.) was remodelled and extended, until by the year 1868 every part of Germany was a member of it, with the exception of the cities of Hamburg and Bremen, and a small part of Baden. This paved the way for the formal entrance of the southern states into the confederation; but they still hung back, though the ideal of a united Germany was gradually growing in force and favour.

In the spring of 1867 a war between Prussia and France seemed imminent, from difficulties arising out of the occupation of Luxemburg by the former; but by the good offices of the British government a congress of the great powers (Italy included) was assembled at London, at which an arrangement satisfactory to both nations was amicably agreed upon, Luxemburg remaining in the possession of the king of Holland. It was evident, however, that hostilities had only been postponed, and on both sides extensive military preparations were carried on.

In 1870 the long-threatened war between Prussia and France broke out. On July 4 of that year the provisional government of Spain elected Prince Leopold of Hohenzollern, a relative of King William of Prussia, to fill their vacant throne. This step gave the greatest umbrage to the French government; and though by the advice of William I. of Prussia Prince Leopold resigned his candidature, it was not satisfied, but demanded an assurance that Prussia would at no future period sanction his claims. This assurance the king refused to give; and on the 19th of July the emperor of the French proclaimed war against Prussia. Contrary to the expectation of France, the southern German states at once decided to support Prussia and the northern states, and placed their armies, which were eventually commanded by the Crown-prince of Prussia, at the disposal of King William.

By the end of July the forces of both countries were congregated on the frontier. Napoleon, however, lost a fortnight in delays after the declaration of war, and it was discovered that the French army was by no means in a state of satisfactory preparation, while the Germans were splendidly organised, and much superior in number. The result was that the French, instead of marching to Berlin as they anticipated, never crossed the Rhine, and had to fight at a disadvantage in Alsace and Lorraine.

On August 2 the French obtained some trifling success at Saarbrück, but the rapidly following battles of Weissenburg (August 4), Wörth, and Spicheren (both August 6) were important German victories. The German advance was hardly checked for a moment, though the losses on both sides were very heavy. The battle of Gravelotte, in which King William commanded in person, was fought on the 18th; and, though the Germans suffered immense loss, they were again victorious, and forced Bazaine to shut himself up in Metz. The Emperor Napoleon and Marshal MacMahon in vain attempted to proceed to the relief of Bazaine. They were surrounded at Sedan, and completely defeated with heavy loss. The emperor surrendered on the 2d September, with his whole army, about 90,000 men, and was sent as a prisoner into Germany. By the 19th of September the Prussians had reached Paris, and commenced a vigorous siege. Strasburg capitulated on the 27th after a severe bombardment; and on 28th October Bazaine surrendered Metz with an army of 6000 officers and 173,000 men, 400 pieces of artillery, 100 mitrailleuses, and 53 eagles. Verdun capitulated on the 8th November; Thionville followed on the 24th; after which there were several capitulations of lesser importance.

The French made extraordinary efforts to raise armies and relieve Paris, but, with the exception of a momentary gleam of success on the Loire, they met with nothing but severe defeats. Of these may be mentioned the battle of December 3 in the Forest of Orleans, and that of Le Mans, January 12, in which contests Prince Frederick-Charles took altogether 30,000 prisoners. After numerous unsuccessful sorties, and enduring great sufferings from famine, Paris surrendered on the 29th of January, and the war was virtually at an end. The French army of the east, 80,000 strong, under Bourbaki, was compelled to retire to Switzerland on the 31st.

By the peace of Frankfort (May 10, 1871) France was condemned to pay a war indemnity of 5 milliards of francs, or £200,000,000; and the province of Alsace, along with the German part of Lorraine, was ceded to Germany.

A very important result of the war was to complete the fusion of the northern and southern states of Germany. The southern states joined at once in the war against France; in November of 1870, Baden and Hesse leading the way, they all became members of the German Confederation; and next month the re-establishment of the German empire was almost unanimously resolved, with the king of Prussia as hereditary emperor. It was at Versailles, on 18th January 1871, that the king was proclaimed emperor of Germany.

The new German empire set vigorously to work to organise itself as a united federation, under the skilful leadership of Prince Bismarck, who was appointed Reichskanzler or Imperial Chancellor. Almost at once it found itself involved in the ecclesiastical contest with the Church of Rome, known as the 'Kulturkampf,' which had previously begun in Prussia. The origin of the struggle was an effort to vindicate the right of the state to interfere, somewhat intimately, with the behaviour, appointments, and even educational affairs of all religious societies in the country. The Jesuits were expelled in 1872, and Pope Pius IX. retorted by declining to receive the German ambassador. The famous Falk or May Laws were passed in Prussia in 1873–4–5, and some of their provisions were extended to the empire. Several German prelates, refusing obedience, were expelled from Germany; and the disorganisation in ecclesiastical affairs became so serious that the Reichstag passed a law in 1874 making marriage a civil rite. The pope issued an encyclical declaring the Falk laws invalid, and matters seemed for a time to be at a deadlock. On the election of a new pope, Leo XIII., in 1878, attempts were made to arrange a compromise between the empire and the papal see. Falk, the Prussian 'Kultus'-minister, resigned in 1879, and certain modifications were made in the obnoxious laws in 1881 and 1883. Bismarck took a further step towards Canossa in 1885 when he proposed the pope as arbiter between Germany and Spain in the dispute as to the possession of the Caroline Islands; and he practically owned himself beaten in the concessions which he granted in revisions of the politico-ecclesiastical legislation in 1886 and 1887. Another semi-religious difficulty which demanded government interference was the social persecution of the Jews (*Judenhetze*), which reached a climax in 1880–81.

In more strictly political affairs the rapid spread of socialism excited the alarm of the government. Two attempts on the life of the emperor (in May and June 1878) were attributed more or less directly to the Social Democrat organisation, and gave the signal for legislative measures conferring very extensive powers upon the administration to be used in suppressing the influence of socialism. These socialist laws, though limited in duration, have invariably been renewed (sometimes with added stringency) before their validity expired; in 1889 several of the most important towns of the empire were in what is called 'the minor state of siege' for police purposes, and a new socialist law was carried, which remained in force till October 1890. A plot, happily futile, to blow up the emperor and other German rulers at the inauguration of the National Monument in the Niederwald in 1883 was considered by government to justify its repressive measures. Prince Bismarck, however, was not content with repressive measures; he had endeavoured by improving the condition of the working-classes to cut the ground from beneath the feet of the socialistic propagandists. The acknowledgment in the emperor's message to the Reichstag in 1881, that the working-classes have a right to be considered by the state, was followed by laws compelling employers to insure their workmen in case of sickness and of accident, and by the introduction (1888) of compulsory insurance for workmen against death and old age—measures that have been by some called 'state-socialism.'

The energetic commercial policy of government also, which since 1879 has been strongly protectionist, has its springs in similar considerations; and the recent colonial policy, which began in 1884 with the acquisition of Angra Pequeña, may be considered to be stimulated partly by the desire to gratify the national self-respect, and partly to provide new outlets under the German flag for the surplus population, and new markets for the home manufactures. None of the German colonies as yet, however, either in Africa or the Pacific Ocean, have proved of any great commercial value. The assembling of the Congo Congress at Berlin in 1885 fitly marked Germany's admission to the list of colonial powers. On the maintenance and improvement of the army and navy the German government has bestowed the most unremitting care, urged especially by the attitude of the 'Revanche' party in France, though hitherto the imperial policy has been entirely pacific.

Considerable parliamentary friction has been caused more than once by the unwillingness of the Reichstag to vote military supplies to the amount and in the manner demanded by the emperor and chancellor. The latter desire to have practically a free hand in military matters, while the national parliament seeks to exercise a constitutional control over the army resembling that illustrated in Great Britain by the annual Mutiny Act. A compromise was effected in 1874 in virtue of which the military strength was fixed and the supplies granted for periods of seven years at a time. In 1886 the government proposed to terminate the current *Septennat* in 1887 instead of in 1888, and to immediately add largely to the peace strength of the army. On the rejection of the bill the Reichstag was dissolved (January 1887) by the emperor and an appeal made to the country. The Iron Chancellor still possessed the confidence and the gratitude of the people, and the new elections in February 1887 resulted in a crushing defeat for the opponents of the government, notably the Freisinnige and the Social Democrats. One of the most remarkable features of this election was a letter written by the pope in favour of the army bill, for which he subsequently received a *quid pro quo* in a further modification of the May laws. The Military Septennate Bill was immediately passed, and was followed in 1888 by a Military Organisation Bill, which made several changes in the conditions of service in the landwehr. The subsequent budgets show an enormous increase in the extraordinary military expenditure. While thus seeking peace by preparing for war, Germany has not failed to use diplomacy for the same end.

A personal meeting of the emperors of Germany, Austria, and Russia in 1872 was considered a proof of a political alliance (*Dreikaiserbund*); and, when Russia drifted somewhat apart from Germany in 1878, an offensive and defensive alliance was formed between Austria and Germany in 1879. Italy afterwards entered this Triple Alliance. Germany's influence on the Eastern Question was recognised in 1878, when the plenipotentiaries of the powers met at the Congress of Berlin.

On 9th March 1888 the Emperor William I. died. His son Frederick, at that time suffering from a cancerous affection of the throat, immediately issued a proclamation, in which he promised to consider

'national needs.' But he died in June, and William II., his son, recurred to Bismarck's policy. Enduring differences between the young emperor and the chancellor on social politics led to Bismarck's retirement in 1890, his successors being General Von Caprivi (1890–94) and Prince Hohenlohe. Anti-Semite controversies continued, and measures for repressing Socialism; and a law was passed (1893) for a great increase in the war strength of the army (ultimately calculated at 4,360,000). There have been many prosecutions for lese-majesty of late years. But the great features of recent German history have been the growth of German trade and commerce, the great colonial expansion in Africa and Polynesia, and the rapid increase of her navy. The amicable agreement with Britain about the Samoa Islands and the boundaries of Togoland helped to create a more friendly feeling between the two countries than had existed. On the outbreak of the Boxer rebellion in China in 1900, resulting in the murder of the German minister at Pekin and the siege of the foreign embassies, Germany acted in union with the other European powers in sending a force which occupied the Chinese capital, and a special Anglo-German agreement was entered into in regard to China.

See histories by Dahn, Dove, W. Menzel, Müller (11th ed. Ber. 1884); Stacke, *Deutsche Geschichte* (Lpp. 1880–81); Treitschke, *Deutsche Geschichte im 19ten Jahrhundert* (5 vols. Lpp. 1879 *et seq.*); Ranke, *Deut. Geschichte im Zeitalter der Reformation* (6th ed. 6 vols. 1881–82; Eng. trans. 1845–47); Muller's *Politische Geschichte der Gegenwart* an annual historical register; with a résumé translated into English by Peters, 1876). Also works by Luden, K. B. Menzel, Leo, Wattz, Souchay, Sugenheim, &c.; see also under FREDERICK THE GREAT, THIRTY YEARS' WAR, BISMARCK, and other special articles.

Works in English: J. Bryce, *Holy Roman Empire* (7th ed. 1884); J. Sime, *History of Germany* (1874, in Freeman's 'Historical' series); C. T. Lewis, *History of Germany* (1874); S. Baring-Gould, *Germany, Present and Past* (2 vols. 1879); Baring-Gould and Gilman, *Germany* (1886, 'Story of the Nations' series); S. Whitman, *Imperial Germany* (1889); *Official (German) Account of Franco-German War*, translated by Major Clarke (1872–84); Seeley's *Life of Stein* (1879); Malleson's *Refounding of the German Empire* (1892); Harbutt Dawson's *Germany and the Germans* (1894); E. F. Henderson's *History of Germany in the Middle Ages* (1894).

LANGUAGE AND LITERATURE. The numerous dialects spoken by the tribes of ancient Germany were all derivatives from one branch of the Aryan or Indo-Germanic family of languages. We can trace the co-existence of the two branches of Teutonic speech known as Low German and High German as far back as the 7th century, but there is no evidence to show that they existed as common uniform languages, from which their variously modified dialects were respectively derived. According to Max Müller, there never was *one* common Teutonic language, which diverged into two streams; while the utmost we can venture to assert in regard to the various High and Low German dialects is that they respectively passed at different times through the same stages of grammatical development. The High German branch—which was spoken in the dialects of Swabia, Bavaria, and Franconia—may be classified under three periods—the Old High German, dating from the 7th century and extending to the period of the Crusades, or the 12th century; the Middle High German, beginning in the 12th century and continuing till the Reformation; and the New High German, dating from Luther's time to our own days. This New High German does not represent the victory of any one High German dialect over the others; it is rather the result of a compromise, which arose in the public tribunals of the empire. Luther found this compromise speech best suited to his purpose in translating the Bible, and his selection of it effectually confirmed it in its literary supremacy. The chief modern High German dialects are the Bavarian, spoken with variations in Bavaria, Salzburg, Tyrol, Upper and Lower Austria, and Styria; Swabian, spoken in Würtemberg and the adjacent parts of Bavaria; and the Alemannic, spoken in Alsace, the south of Baden, and German Switzerland. The Saxon, Thuringian, Silesian, Franconian, and other High German dialects are grouped together as Middle German dialects. Each of these has a living literature of its own. Low German embraced two main branches, Lower Franconian and Old Saxon. The former, in which we have a fragment of a 9th-century translation of the *Psalter*, developed a tolerably rich literature in the 13th century, which subsequently gave birth to the Dutch and Flemish tongues. The oldest literary monument of Old Saxon also belongs to the 9th century; it is a Christian epic known as *Der Heliand* (q.v.)—i.e. The Healer or Saviour. Old Saxon developed into Middle Low German after the 13th century, with a copious enough literature, of which *Reineke Vos* (*circa* 1490), a translation from the Dutch branch, is the most important relic; and there are traces of popular Low German literature down to the 17th century. The chief extant dialects are the Frisian (q.v.) and Platt-Deutsch (q.v.). In addition to the various dialects which are commonly included under the heads of High and Low German, an important evidence of the cultivation of a form of German differing equally from the High and Low groups has been preserved to us in the Gothic translation of the Bible, which was made in the 4th century by Bishop Ulfilas. See GOTHS, PHILOLOGY.

The diffusion of Christianity among the Germanic tribes had the effect both of suppressing the use of the Runic characters that had been common to them and of changing the character of their literature, for, instead of the heroic sagas and 'beast-epics' (*Thier epos*) of a sanguinary paganism, scriptural paraphrases, legends, and hymns were now selected; while the ancient system of alliteration by degrees gave place to the rhyming arrangement of the Latin versification common in the early periods of the middle ages. Charlemagne himself made a collection of German popular poetry; and under his successors in the 9th and 10th centuries some of the heroic epics dating from heathen times were written down (e.g. the *Hildebrandslied*), while the matter of others received a Latin dress at the hands of monkish poets. Under the Saxon emperors Latin became the language of the court, the church, and the law, while German was left entirely to the people, down to the first flourishing period of German poetry under the emperors of the Hohenstaufen line. The Italian wars of this dynasty, the stirring events of the Crusades, and the intercourse with the chivalry of France and Italy kindled a love for literature and romance in the princes and nobles of Germany. The vernacular dialects were once more used for literary purposes, especially the Swabian or court-speech. Many, both nobles and men of lower degree, belonged to the order of the *Minnesänger* (or Singers of Love), who roamed from castle to castle and from court to court, exhausting their ingenuity in devising new presentments of their usual subject, the romantic passion of love, and in inventing new and elaborate forms of versification. The epic subjects chiefly selected during the 13th and 14th centuries, by both courtly and popular singers, were based on the history of Troy, the deeds of Alexander the Great, the legendary lore of Charlemagne and his

paladins, and King Arthur and his knights, and of the Sangrael; and it is to this period that we must refer the *Nibelungen Lied* and *Gudrun*, which rank as the greatest treasures of German national literature. It was to these tales of Parzival, Lohengrin, and the Nibelungen that Richard Wagner turned in his efforts to create a national school of music-drama in the 19th century. Among the most successful romantic and epic poets and minnesingers belonging to the Swabian period we may specially indicate Heinrich von Veldeke, Gottfried of Strasburg, Ulrich von Lichtenstein, Hartmann von der Aue, Neidhart of Bavaria, Wolfram von Eschenbach, Walther von der Vogelweide, and Heinrich von Ofterdingen. The *Krieg auf der Wartburg*, which has been classed among the didactic poems of this age, relates a mythical contest of poetic skill between the three last named. The taste for the *Thier-epos* received a new impetus among the people in the middle of the 12th century by the re-translation, from the French into German, of the ancient poem of *Reinhard Fuchs*, which, according to the distinguished philologist Jakob Grimm, originated with the Frankish tribes, who carried it with them when they crossed the Rhine and founded an empire in Gaul, and from whom it was diffused among the neighbouring tribes of northern France and Flanders. German now began to be used for public proclamations and in collections of laws, of which the *Sachsenspiegel* (1230) and the *Schwabenspiegel* (1270) are the most noteworthy.

The period which succeeded the decline of chivalry was marked by a thorough neglect, among the higher classes, of national literature, which thus fell into the hands of the people. Yet some few chronicles, among which may be mentioned those of Limburg, Alsace, and Thuringia, were composed in the century from 1330 to 1430. This was the age of the *Meistersänger*, or artisan-poets, who formed themselves into guilds like their trade guilds, and composed their verses in conformity with the strict guild rules. 'Meistergesang' was at its zenith at the era of the Reformation; its most famous representative was Hans Sachs, the shoemaker of Nuremberg, who also wrote epics, fables, and dialogue-pieces. The most honourable place among the pioneer cultivators of German prose-writing belongs to Meister Eckhart, Tauler, Suso, and their followers, the mystics. To this age belongs also a great mass of the *Volkslieder*, or national ballads, in which Germany is specially rich; the fables and satires of Brandt (*Narrenschiff*, or *Ship of Fools*) and Mürner, and the romances of the satirist Johann Fischart. Most of the *Volksbucher* too, such as *Die Melusine*, *Die Haimonskinder*, *Kaiser Octavianus*, *Wagalois*, *Tyll Eulenspiegel*, *Dr Faust*, and *Die Schildburger*, were written in the 15th and 16th centuries to meet the demand of the people for imaginative literature. The mysteries and passion-plays, which were at their height in the 15th century, and still linger at Oberammergau, in Upper Bavaria, and one or two other places, may be said to have given origin to the German drama, which numbered among its earliest cultivators Sachs, Rebhuhn, and Ayrer. The close of the 15th century produced several satires on the clergy and numerous theological writings for and against the tottering power of the Romish Church.

The writings of Luther, particularly his translation of the Bible, which fixed a literary language for the Germans, and the works of Ulrich von Hutten, Zwingli, and of many of the other reformers, were, however, the most important events in the history of German literature from the close of the 15th to the middle of the 16th century. But Luther addressed himself to the minds of his countrymen not merely through his polemical writings, but also by those noble hymns which, since his day, have constituted one of the greatest literary treasures of the kind. Many beautiful *Kirchen-lieder*, or church songs, were composed during the next centuries; to the 17th belong those of Gerhardt, Franck, and Scheffler, who may be counted among the best hymn-writers of Germany. Nor should the Roman Catholic hymns of Angelus Silesius be passed over. The example of Luther as a writer of prose German was laudably followed by Sebastian Franck in his historical books, by the mystic Jacob Böhme, and Arndt, the most widely read religious writer of the 18th century.

The fervent effusions of the devout and eloquent reformers were followed by a period of literary degeneration and stagnation, which is in a great measure to be ascribed to the demoralising effects of the Thirty Years' War, when Germany was a prey to all the evils inseparable from civil strife, fostered by foreign interference. The indirect result of this period of anarchy was to quench the national spirit and vitiate the popular taste; for, while the petty courts aped the habits, language, and literature of Versailles, the lower orders forgot their own literature, with its rich treasures of legends, tales, and ballads, and acquired a taste for the coarse camp-songs imported by foreign mercenaries, and the immoral romances borrowed from impure French and Italian sources. Almost the only names that break this barren wilderness are Moscherosch, a satirist; Grimmelshausen, who has left vigorous pictures of the Thirty Years' War; and Abraham a Santa Clara, a satirical preacher, possessed of both wit and humour.

What is known as the first Silesian school of German poetry was formed under the influence of the correct but cold Opitz (1597–1639); and he was staunchly supported by the lyric poet Fleming and the epigrammatist Logau. The succeeding second Silesian school, headed by Hoffman von Hoffmanswaldau, sought inspiration in the inferior Italian poets, and produced affected and extravagant pastorals. But, on the whole, the study of the national literature was neglected, and, although a host of learned societies were formed whose professed object was to purify and elevate the public taste, the results were lamentably unsatisfactory. The poems of Hagedorn (1708–54) and Haller (1708–77) struck a truer and more natural note. But it was not till Gottsched (1705–66) succeeded, in his *Critical Art of Poetry*, in drawing attention to the turgid pedantry and artificial stiffness of the classicist school that a better taste was awakened. In opposition to the Leipzig school, of which Gottsched was the centre, there arose the Swiss or Zurich school, in which Bodmer and Breitinger were the leaders. An adverse criticism by Gottsched of Bodmer's translation of *Paradise Lost* precipitated a controversy, known as the *Bodmer Streit*. The Leipzig school attached all importance to the purely intellectual and mechanical correctness of poetry; while Bodmer and his disciples considered rather the imaginative and emotional elements. As more or less the outcome of this contest arose the Saxon school, the leading member of which was the hymn-writer and fabulist Gellert, who for some years posed as the literary dictator of Germany; the Halle school with Gleim at its head; and the German æsthetic school, under the guidance of A. Baumgarten.

In the end of the 17th century German philosophy first lifted up its head in the writings of Leibnitz, C. Wolf, and Thomasius. Rabener and other contributors to the *Bremer Beitrage*, a group of lyric and dramatic writers who flourished in the beginning of the 18th century, were perhaps the first to bring literature

again into immediate touch with popular life. But it is with the names of Klopstock, Lessing, Wieland, and Herder that the brilliant epoch of modern German literature begins. Their influence was alike great and varied; for, while Klopstock's poem of the *Messiah*, and his *Odes*, in which he had taken Milton as his model, re-echoed the tender piety of the old reformers, and were so thoroughly German in their spirit that they at once met with an enthusiastic response in the hearts of the people, Lessing's comedy of *Minna von Barnhelm* and his drama of *Nathan der Weise* may be said to have created anew the dramatic art in Germany. Wieland, on the other hand, was the complete antithesis of Klopstock, although, like Klopstock and Lessing, he was the founder of a new style. He gave a graceful flexibility to German diction which it had never before been made to assume, imparted to his numerous tales and romances an undisguised sensuous materialism, which, like his style, had been borrowed from the French philosophers of his day, and thus introduced into the language and literature of Germany the germs of many defects, as well as graces, to which they had hitherto remained strangers. Herder is the typical representative of those who resorted for their inspiration to the simplicity of the *Volkslieder* and the poetry of nature and of the Orient. His predominant tendencies are indicated in his favourite motto, 'Light, love, life.' And he also did admirable work as a philosopher and critic. In fact, his philosophical critiques of foreign and German literature contributed materially to the complete literary revolution which ushered in the modern period of German poetry. The influence exerted on German literature by these writers, who may be regarded as its regenerators, was soon appreciable in every branch of knowledge. The Swiss Salomon Gessner shows some literary kinship with Klopstock in his sweetly sentimental idylls. Blumauer and Kortum, seeking to perpetuate the irony of Wieland, made travesty of more serious effusions. And it was in the same vein, but seasoned with stronger satire, that Lichtenberg wrote. From the impulse communicated by Lessing came the critical æsthetic writings of Winckelmann, and the books of men like Zimmermann (author of *On Solitude*) and Moses Mendelssohn. The aims which Herder had set before him were adopted by a band of writers whose chief characteristics conferred upon the age they lived in the name of the *Sturm-und-Drang* period. But the poetic spirit raged in them too violently and refused to be subjected to the laws and restraints of artistic production. Klinger, one of whose dramas gave title to the school, and 'Maler' Müller were the champions of the movement. Hamann, in spite of his oracular and enigmatical utterances, had much in common with this school, though he did not belong to it.

Among the galaxy of great names which have imparted renown to the literary and scientific annals of Germany during the last hundred years we can only instance a few of the principal writers who have more especially enriched the several departments of learning with which they have been associated. Philosophy, which originated, as stated, with Leibnitz (1646-1716), who, however, wrote in Latin and French, assumed a degree of individuality and completeness through the intellectual acumen and subtle analysis of Kant, Fichte, Schelling, and Hegel which have no parallel in any other country. Other names worthy of mention in this department are Fries, Jacobi, Herbart, Schopenhauer, Zeller, Feuerbach, Baader, Ed. von Hartmann, Lotze, Haeckel, Fechner, Wundt, and Pfleiderer. In theology Reinhard, Paulus, Schleiermacher, De Wette, Marheineke, Neander, Julius Müller, Lücke, Baur, Strauss, Mohler, Dollinger, Ewald, Hase, Lipsius, Dorner, Ritschl, Wellhausen, Holtzmann, and a host of others have infused new life into biblical inquiry. Invaluable results have been attained by the philological and critical researches of F. A. Wolf, Hermann, Müller, J. and W. Grimm, Bopp, Lassen, Gesenius, Schlegel, W. Humboldt, Lepsius, Bunsen, Von der Hagen, Lachmann, Simrock, Moritz Haupt, Benfey, Pott, Schleicher, Steinthal, Diez, &c. In archæology, history, and jurisprudence all nations owe a debt of gratitude to Winckelmann, Heeren, Lobeck, Von Raumer, Schlosser, Von Hammer, Gervinus, Dahlmann, Waitz, Ranke, Bluntschli, Niebuhr, Mommsen, and Duncker.

In poetry and belles-lettres the name of Goethe is a host in itself. In his *Leiden des Jungen Werther* ('The Sorrows of Young Werther') he carried the sentimental tendencies of the *Sturm-und-Drang* school to their culminating point; but his own later and very numerous works became in time more and more free from its blemishes, and rose to an almost Olympic calm, a Hellenic strength, and grace, and proportion. In Goethe's middle period he was intimately associated with Schiller (1759–1805), whose early works, *The Robbers*, *Fiesco*, and *Don Carlos*, threw the whole German people into a frenzy of excitement. Schiller's later dramatic works, if less exciting than these, gave evidence of more matured taste, while some of his ballads and lyrics may be said to stand unrivalled. The tendency of the German poets for drawing together into schools was again exemplified in the case of the *Göttinger Dichterbund*, formed at Gottingen about 1770. Its leading spirit was Voss, better known for his translation of the Homeric poems than for his idyllic *Luise*. With him were associated more or less closely Bürger (author of *Lenore*), Hölty, the two Counts Stolberg, and Claudius. They took Klopstock for their high-priest, and sang of friendship, love of country, and all high and noble ideals. Among the works of prose fiction which appeared soon after this period are the novelettes of Zschokke, the romantic tales of Vulpius, the artistic romances of Heinse, and the humorous romances of Hippel and J. G. Müller. Iffland attained great reputation as a writer of sensational dramas, and Kotzebue as an inexhaustible composer of light effective comedies.

The Romantic school, which succeeded the *Sturm-und-Drang* period, found for a while its inspiration in the medieval romances and in Shakespeare, admirably translated by Schlegel and Tieck. Its chief representatives and defenders were A. W. Schlegel, Friedrich von Hardenberg, better known as Novalis (1772–1801), Tieck, Fr. Schlegel, Schelling, and Wilhelm von Humboldt. Kleist is the chief dramatist of the school. Among the writers who were smitten with the same tendencies are the poet Hölderlin, and De la Motte Fouqué, E. T. W. Hoffmann, and Chamisso, who loved to dwell on the mysterious agencies of nature, which they attempted to individualise and bring into association with material forms, as in the *Undine* of the first, the fantastic tales of the second, and the *Peter Schlemihl* of the third. Jean Paul Richter, the satirist and humorist, though sometimes included in the Romantic school, in reality occupies a position apart from and far above his compeers; and few novelists ever exerted so lasting an influence on the literature and mode of feeling of their compatriots as that which Richter exercised over the minds of the middle classes of Germany during the close of the last and the early part of the present century. Poetry has also found noble representatives in the so-called *Vaterlandsdichter* (Poets of the Fatherland), among whom we may

instance Theodor Körner and Arndt, whose spirited patriotic songs are intimately associated with the war of 1813 against Napoleon, in which the former fell fighting gloriously. Rückert and Uhland belong to the same school: but the former is more especially known for his admirable adaptations and translations from oriental languages, and the latter for his exquisite romances and ballads.

The public taste in fiction still encouraged the production of sentimental tales, in a sickly style, of which Clauren may be mentioned as an example, chiefly on account of the ridicule directed against him by the novelist Hauff, the champion of a healthier taste. Spindler, Wilibald Alexis (W. Häring), whose *Walladmor* and other books are imitations of Walter Scott, and Caroline Pichler also belonged to a sounder and more artistic school. Raupach occupied the stage with his historical tragedies and his comedies, rivalled in south Germany by Baron von Auffenberg, and on the Rhine by Immermann, known also as the author of the romance *Münchhausen*. Adolf Müllner and Grillparzer are also important names in the later history of the German drama.

The decade 1830 to 1840 is usually spoken of in German literary histories as the period of 'Young Germany,' a period of gifted but somewhat immature striving for independence and free self-development. Count Platen in his odes, sonnets, comedies, &c. represents the transition to this era, of which Karl Gutzkow, Börne, and Laube may be taken as characteristic representatives. But the greatest name of this time is that of Heinrich Heine, who ranks with Goethe and Schiller for lyrical power, and at the same time is master of an almost matchless prose style. Menzel signalised himself by his attacks upon Goethe, Heine, and Gutzkow. Auerbach may be regarded as the creator of the *Dorfgeschichte* or village story, in which he has been followed by Maximilian Schmidt and Anzengruber. The sombre and sentimental Lenau (Niembsch von Strehlenau) is perhaps the chief name of the later Austrian school, which includes Count Auersperg (Anastasius Grün), Karl Beck, Moritz Hartmann of Bohemia, and A. Meissner. Emanuel Geibel, even yet one of the most popular lyric poets in Germany, was the head of the band of poets who assembled round King Maximilian of Bavaria, among whom also were Dingelstedt, Bodenstedt (whose exquisite poems in the oriental style were published under the *nom de guerre* of Mirza Schaffy), and Paul Heyse. Gottschall wrote epic poems as well as dramas. Hebbel and Grabbe were both dramatists of vigorous but ill-disciplined power. Prutz, Hoffmann von Fallersleben, Schulze, Herwegh, Hebel, Freiligrath, (peculiarly skilful as a translator of English, Scottish, and French poetry), Schefer, Schack, Hamerling, and Leander (Volkmann) may also be mentioned among recent writers; Freiligrath and Hamerling have done better than average work as poets. Among modern epic poets are Jordan (*Die Nibelungen*), Kinkel, Redwitz (*Amaranth*), Otto Roquette (*Waldmeister's Brautfahrt*), Scherenberg, Böttger, and Victor von Scheffel (*Trompeter von Säkkingen*). Many of these are also dramatists; others are Halm (Baron Münch-Bellinghausen), Moser (a 'second Kotzebue'), Freytag, Ernst von Wildenbruch, Fitger, and Anzengruber. Paul Lindau has made a success as a writer of neat comedies; and in even slighter work Benedix, Töpffer, Blum, &c. are well-known names. Fiction in Germany, as with ourselves, has been developed to an enormous extent in the present century, and no more than a few of the most prominent names can be here mentioned. Ida von Hahn-Hahn, Fanny Lewald, Johanna Schopenhauer, Von Hillern, and E. Marlitt are among the best known of the lady-novelists, who have recently been joined by 'Ossip Schubin' (A. Kirschner). Gustav Freytag, one of the oldest, is still the most eminent of recent novelists. Spielhagen, Hackländer, Gottschall, Gerstäcker, Paul Heyse, Charles Sealsfield, Ebers, Dahn, Scheffel, Lindau, Gottfried Keller (a Swiss), Oskar Meding (Samarow), Franzos, and George Taylor (Hausrath) have all in turn enjoyed wide popularity, to which some of them are still adding. Low German has been elevated to the dignity of a literary tongue by Fritz Reuter, one of the greatest, if not the greatest, of German humorists, and by Klaus Groth.

But numerous as have been writers of poetic and dramatic literature during the present century in Germany, the tendency of the German mind has of late years been rather to science than fiction. The immense impetus given to the taste for scientific inquiry by A. v. Humboldt's Travels, and by his *Cosmos* and *Views of Nature*, has been followed by the appearance of a multitude of records of travel, among the more important of which we can only instance those of Martius in Brazil, Pöppig in South America, Tschudi in Peru, Lepsius and Brugsch in Egypt, Schomburgk in British Guiana, Gützlaff in China, Siebold in Japan, the brothers Schlagintweit in the Alps and in central Asia, Barth, Vogel, Rohlfs, and Schweinfurth in Africa, and Leichhardt in Australia.

In conclusion we can only group together the names of a few of the many eminent Germans who by their labours and researches in physical and natural science have at once enriched the knowledge of the world and enhanced the literary and scientific glory of their own country. Without again referring to writers who have been already mentioned, we may specially instance, in astronomy and mathematics, Bessel, Encke, Struve, Gauss, and Mädler; in the natural sciences and in medicine, Johannes Müller, Ehrenberg, Carus, Oken, Schleiden, Von Buch, Liebig, Kopp, Simon, Dove, Virchow, Moleschott, Bischoff, Rose, Vogt, Werner, Poggendorf, Erdmann, Gmelin, Gräfe, Vogel, Rokitansky, Wagner, Schönbein, Helmholtz, Haeckel, Mitscherlich, W. Weber, Kirchhoff, Neumann, Du Bois Reymond, Hahnemann, Hufeland, Von Baer, and Dieffenbach; in history, archæology, and biography, Leo, Duncker, Curtius, Giesebrecht, Sybel, Treitschke, Becker, Boeckh, Preller, Creuzer, Jacobs, Wachler, Kuno Fischer, Preuss, Böttiger, Varnhagen v. Ense, Pertz, Lappenberg, Pauli, &c.; in geography, ethnology, statistics, politics, &c., Berghaus, Ritter, Petermann, Stein, Hübner, Klöden, Kohl, Bunsen, Bastian, Ideler, Zachariä, Gentz, Gneist, Ruge, Roscher, Schäffle, Riehl, Lassen, Unger, Zimmermann, and Otto Peschel; in law and jurisprudence, Savigny, Thibaut, Eichhorn, Pütter, Waitz, Feuerbach, Grolmann, and Mittermaier; in the history of æsthetics and the fine arts, Fr. Vischer, Carriere, R. Zimmermann, Weisse, Schassler, Ed. Müller, Waagen, Kirchmann, and Lübke.

The genius of her musicians has placed Germany at the head of the musical world. Such names as Seb. Bach, Handel, Gluck, Mozart, Haydn, Beethoven, and P. E. Bach in the 18th century, and Schubert, Spohr, Weber, Mendelssohn, Schumann, Brahms, Liszt (though a Hungarian by birth), and Wagner in the 19th, are known to all who take an interest in the art of sweet sounds. In connection with this subject the writings of Helmholtz, Köstlin, Ehrlich, Schumann, Wagner, and Liszt should be noticed.

Detailed accounts of the lives and literary careers of the principal writers, such as Goethe, Heine, Herder, Reuter, Richter, Schiller, &c., will be found under their several names. See also such articles as

Æsthetics, Biography, Drama, Music, Philosophy, Plate Deutsch, Romanticism; and for the German printed character, Black Letter.

Lexicons.—The standard authority on German Lexicography is the great *Deutsches Wörterbuch*, begun in 1852 by the brothers Grimm, and still in progress, under the care of Moriz Heyne, Rudolf Hildebrand, Matthias Lexer, Karl Weigand, and L. Wuncker. Admirable books are the Dictionaries by D. Sanders (1860-65) and Kluge (1882); and the smaller books by Sanders (3d ed. 1883) and Weigand (4th ed. 1882), the latter the best of all the smaller dictionaries. Other successors of the Grimms were Hoffmann von Fallersleben, Uhland, Schmeller, Graff, Massmann, W. Wackernagel, M. Haupt, R. v. Raumer, Fr. Pfeiffer, Holtzmann, Mullenhoff, Zarncke, Bartsch, Wernhold, Paul, and Sievers; as well as, in the wider sense, Bopp and Schleicher. A few special books that may merely be named are Lexer's *Mittelhochdeutsches Handwörterbuch* (1869-74); Diefenbach and Wulcker's *Hoch- und Nieder Deutsches Wörterbuch der Mittleren und Neueren Zeit* (1874-85); O. Schade's *Altdeutsches Wörterbuch* (2d ed. Halle, 1872-82); Grimm's *Deutsche Grammatik*, edited by W. Scherer (Berlin, 1869-78); H. Rückert's *Geschichte der Neuhochdeutschen Schriftsprache* (1875); R. v. Raumer, *Geschichte der Germanischen Philologie* (1870); Ebert, *Die Litteratur der Deutschen Mundarten* (bibliographical, Halle, 1884); and Strong and Meyer's *Herbert in the German Language* (1886).

Literature.—See W. Scherer's *Geschichte der Deutschen Litteratur* (Berlin, 1883), of which the Clarendon Press at Oxford has published a translation (2 vols. 1886); Koberstein's *Grundriss der Gesch. der Deut. Nationallitteratur* (6th ed. 5 vols. Leip. 1872-74); Vilmar's *Gesch. der Deut. Nationallitteratur* (22d ed. 2 vols. 1885); Stern's *Lexicon der Deutschen Litteratur* (1882); and works by Wackernagel, Kurz, Gervinus (German poetry), Goedeke (poetry), Roquette, Koenig (illustrated), and Gottschall; for literature of 18th century, Hettner, Hillebrand, and Biedermann; for literature of 19th century, Julian Schmidt. Taylor of Norwich, Coleridge, De Quincey, Carlyle, and Lewes did much to spread the taste for German literature in England. See also Metcalfe's *Hist. of Ger. Lit.* (1858, based on Vilmar); W. Menzel's *History of Germans Literature* (trans. 4 vols. 1840); Bayard Taylor's *Studies in Ger. Lit.* (1879); and Hallam's *Lit. Hist. of Europe in the Middle Ages*. Among more recent books are Gostwick and Harrison's *Outlines of German Literature* (2d ed. Lond. 1883); A. M. Selss's *Critical Outlines of Lit. of Germany* (trans. Lond. 1884); and W. M. MacCallum's *Studies in High German and Low German Literature* (1889).

Germen, a disused botanical synonym for Ovary (q.v.).

Germersheim, a town of the Bavarian Palatinate, occupies a marshy site on the left bank of the Rhine, 8 miles SSW. of Spires. Founded in 1276, it fell into the hands of the French in 1644, 1674, and 1688; and in 1793 the Austrians here defeated the French. Pop. 6132.

Germinal, the 'budding' month (March-April) in the French revolutionary Calendar (q.v.).

Germination (Lat. *germinatio*, 'sprouting'), the beginning of growth in a seed, or of the developmental process by which it is converted into a new plant. See Seed; also, for cryptogamic plants, Ferns, Fungi, &c.

Germ Theory. See Germ.

Gérôme, Léon, French historical genre painter, was born at Vesoul, 11th May 1824, and in 1841 entered the studio of Paul Delaroche at Paris, at the same time attending the School of the Fine Arts. He began to exhibit in 1847; in 1855, 1857, and 1864 he travelled in the East; and in 1863 he was appointed professor of Painting in the School of the Fine Arts. His first great picture, 'The Age of Augustus and the Birth of Christ,' was exhibited in 1855; and four years later his 'Roman Gladiators in the Amphitheatre' raised to the highest pitch his reputation as a colourist and painter of the human figure, a reputation which was still further enhanced by 'Phryne before her Judges' (1861). In the same year he exhibited, among other pictures, 'Socrates searching for Alcibiades at the House of Aspasia,' 'The Two Augurs,' and a portrait of Rachel. 'Louis XIV. and Molière,' 'The Prisoner,' 'Cleopatra and Cæsar,' 'The Death of Cæsar,' 'The Plague at Marseilles,' 'Death of St Jerome,' 'Lioness meeting a Jaguar,' 'Rex Tibicen' (1874), and 'L'Eminence Grise' (1874) are among the best known of his subsequent works. See Mrs C. H. Stranahan, *History of French Painting* (1889).

Gerona (anc. *Gerunda*), capital of the Spanish province of the same name, is situated 65 miles by rail NE. of Barcelona. It contains a beautiful Gothic cathedral of the 14th and 15th centuries. The inhabitants carry on the manufacture of paper, cork-cutting, spinning, and weaving. The fortifications are now of little value. Pop. 15,015. The town was formerly a place of great strength, and has undergone several notable sieges, particularly in 1653, 1684, 1694, 1706, and 1809, on each occasion by the French.—The *province* of Gerona measures 2271 sq. m. in extent, and had in 1883 a pop. of 301,536.

Gerry, Elbridge, American statesman, was born in Marblehead, Massachusetts, 17th July 1744, graduated at Harvard in 1765, and was elected to the Massachusetts Assembly in 1773. He was a member of the Continental Congress of 1776, and served on several important committees; and in 1789 the Republican party elected him to the first National Congress. He was one of the envoys sent in 1797 to establish diplomatic relations with France. His colleagues, Marshall and Pinckney, being Federalists, were ordered to quit France, but Gerry was permitted to remain; and he did remain, to the indignation of Americans, until his recall was ordered. Elected governor of Massachusetts in 1810, Gerry, who was a keen partisan, removed the holders of civil offices and replaced them with Republicans; and he unfairly rearranged the districts of the state so as to secure the advantage to his own party—a manœuvre for which his opponents coined the word *gerrymander*. He was defeated in 1812, but his party rewarded his zeal by electing him to the vice-presidency of the United States, in which office he died, 23d November 1814, at Washington. There is a Life by James T. Austin (2 vols. Boston, 1828-29).

Gers, a department in the south-west of France, separated by Landes from the Bay of Biscay, with an area of 2415 sq. m., a climate healthy and temperate, a soil only moderately productive, no mineral riches, scarcely any trade, and an agricultural population, among whom education has not risen above a very low level. In 1861 there were 298,931 inhabitants, but the number has since steadily decreased; in 1881 it had fallen to 281,532; in 1891 to 261,084. There are parallel lines of hills in the south, separated by fan-shaped valleys which expand as they extend towards the plains in the north. The Gers and other principal rivers are tributaries of the Garonne and Adour. One-half of the surface is devoted to agriculture, and nearly a sixth to vineyards. Wine of very moderate quality is produced in considerable quantity; great part of it is converted into Armagnac brandy, which, after Cognac, is esteemed the best. The department has five arrondissements, those of Auch, Condom, Lectoure, Lombez, and Mirande; the capital is Auch.

Gersau, a village in the Swiss canton of Schwyz, on the Lake of Lucerne, and near the foot of the Rigi. Population, 1850. From 1390 till it was absorbed by the French in the Helvetian Republic (1798) the village and its territory, 5 miles square, was an independent republic. In 1817 it became part of Schwyz. See Coolidge in the *Engl. Histor. Review*, July 1888.

Gerson, JOHN, one of the most eminent scholars and divines of his time, was born at the village of Gerson, in the diocese of Rheims, December 14, 1363, his proper name being Jean Charlier. He was educated in Paris, at the College of Navarre, under the celebrated Peter d'Ailly. Here he rose to the highest honours of the university, and ultimately to its chancellorship, having acquired by his extraordinary learning the title of Doctor Christianissimus. He was a clear and rational theologian, an enemy to scholastic subtleties, while his reason found rest from all its difficulties in a devout Christian mysticism. During the unhappy contests which arose out of the rival claims of the two lines of pontiffs in the time of the Western Schism, the university of Paris took a leading part in the negotiations for union; and Gerson was one of the most active supporters of the proposal of that university for putting an end to the schism by the resignation of both the contending parties. With this view he visited the other universities, in order to obtain their assent to the plan proposed by that of Paris. But, although he had the satisfaction of seeing this plan carried out in the Council of Pisa, it failed, as is well known, to secure the desired union. In a treatise inscribed to his friend D'Ailly he renewed the proposal that the rival pontiffs (now not two, but three since the election of John XXIII. at Pisa) should be required to resign; and in the new council held at Constance in 1414 he was again the most zealous advocate of the same expedient of resignation. But his own fortunes were marred by the animosity of the Duke of Burgundy and his adherents, to whom Gerson had become obnoxious, and from whom he had already suffered much persecution, on account of the boldness with which he had denounced the murder of the Duke of Orleans. To escape their vengeance he was forced to remain in exile; and he retired from Constance, in the disguise of a pilgrim, to Rattenberg in the Tyrol, where he composed his celebrated work, *De Consolatione Theologiæ*, in imitation of that of Boëthius, *De Consolatione Philosophiæ*. It was only after the lapse of several years that he was enabled to return to France, and take up his residence in a monastery at Lyons, of which his brother was the superior. He devoted himself in this retirement to works of piety, to study, and to the education of youth. The only fee he took from his pupils was a promise to repeat the prayer, 'Lord, have mercy on thy poor servant Gerson.' He died 12th July 1429, in his sixty-sixth year. His works fill five volumes in folio (Antwerp, 1706). The famous treatise on the *Imitation of Christ* (q.v.) has been ascribed to him by some writers, but it is now hardly doubtful that the true author was Thomas à Kempis. The authority of Gerson is much relied on by the advocates of Gallican principles; but the Ultramontanes allege that the principles laid down by him as to the authority of the pope are only applicable to the exceptional case in which he wrote. See German studies by Schmidt (1839) and Schwab (1858).

Gersoppa Falls, on the Sharawati river in the west of India, 30 miles SE. of Honawar, are 960 feet high, one sheer leap being 890 feet.

Gerstäcker, FRIEDRICH, a German novelist and writer of travels, was born at Hamburg, 10th May 1816. Animated with an irrepressible impulse for travel, he in 1837 went to New York, and began a six years' tramp through the United States, part of the time working at various trades, part of the time leading an adventurous life as a hunter in the forests. In 1843 he returned to Germany, and published *Streif- und Jagdzüge durch die Vereinigten Staaten* (1844), *Die Regulatoren in Arkansas* (1845), *Die Flusspiraten des Mississippi* (1848), &c. Leaving home again in 1849, he travelled round the world by way of America, Polynesia, and Australia, reaching Germany in 1852. Most of the years 1860–61 were spent in South America; in 1862 he accompanied Duke Ernest of Gotha to Egypt and Abyssinia; and in 1867–68 he undertook another long journey, visiting North America, Mexico, Ecuador, Venezuela, and the West Indies. Of this last he gave a description in *Neue Reisen* (1868). His best books include *Tahiti*, *Die Beiden Straflinge*, *Unter dem Äquator*, *Gold*, *Inselwelt*, and *Um die Welt* (1847–48). His *Gesammelte Schriften* appeared in 44 vols. in 1872–79. Gerstäcker died at Brunswick, 31st May 1872. His works, of which several have been translated into English since 1847, owe their popularity to their simple, homely style, and to the vigour and truth of the descriptions and characters.

Gervas (*Stachytarpheta Jamaicensis*), a small verbenaceous shrub of the West Indies and tropical America. It is regarded as of high medicinal value, and was used by the Indian sorcerers as its ally the vervain was in Europe. It has also been introduced into Europe as Brazilian tea, and also frequently employed as an adulterant of tea proper.

Gervase OF CANTERBURY, a monk who wrote a painstaking and fairly trustworthy chronicle of the reigns of Stephen, Henry II., and Richard I., and also a history of the archbishops of Canterbury down to Hubert Walter. These works are valuable especially as elucidating the contemporary relations between church and state, though Gervase seems to have been animated throughout by a persistent dislike to the House of Anjou. The former was edited by Bishop Stubbs for the Rolls series (2 vols. 1879–80).

Gervase OF TILBURY, a historical writer, born probably at Tilbury in Essex about the middle of the 12th century, and often said, without any foundation, to have been a nephew of King Henry II. of England. He lectured on canon law at Bologna, and was, under the Emperor Otho IV., marshal of the kingdom of Arles, and lastly provost of the nunnery at Ebsdorf. He died about 1235. His chief work is his *Otia Imperialia*, composed about 1212 for the entertainment of his imperial patron; the first two books consisting of an abstract of geography and history, the third containing a collection of curious beliefs about the 'Veronica,' British sirens, the magnet, and the like. The non-historical portions of the work were edited by Felix Liebrecht (Hanover, 1856). The whole was printed admirably by Leibnitz in vol. i. of *Scriptores Rerum Brunsvicensium*. Many other works have been attributed erroneously to Gervase of Tilbury. A *Liber Facetiarum*, or book of anecdotes, he tells us he prepared for Henry II. of England.

Gervinus, GEORG GOTTFRIED, German historian, was born at Darmstadt, 20th May 1805. Though at first engaged in commerce, he contrived to pursue his studies privately, then at the universities of Giessen and Heidelberg. In 1836 he was appointed professor of History at Göttingen. Already he had begun to publish his *Geschichte der poetischen Nationalliteratur der Deutschen* (5 vols. Leip. 1835–42), which, under the new title of *Geschichte der Deutschen Dichtung*, reached a fifth edition under the care of K. Bartsch, 1871–74. In 1837 he was one of the seven Göttingen professors who signed the famous protest against the abolition of the Hanoverian constitution, in consequence of which he lost his chair, and was ordered to leave the country within three days. He went first to Darmstadt, then to Heidelberg, thence to Rome, and was in 1844 appointed honorary professor in Heidelberg. From this period his career was that of an active political writer in behalf of constitutional liberty. In July 1847 he helped to establish

the *Deutsche Zeitung* in Heidelberg, and next year was elected a member of the National Assembly by a district of Prussian Saxony. After the failure of the national democratic party in Germany, Gervinus returned disheartened to his literary pursuits, one of the fruits of which was his great work on Shakespeare (4 vols. 1849–52; 4th ed. 1872; Eng. trans. new ed. 1875), which may be regarded as on the whole the most important German contribution to Shakespearian criticism. The analyses of the characters show insight, learning, and much ingenuity; but the critic strains the interpretation in order to bring Shakespeare into harmony with his theory of him as the absolute and perfect dramatist. The book has been called in Germany the 'bulwark of Shakespearomania.' A later work was the *Geschichte des 19ten Jahrhunderts* (8 vols. 1856–66). Gervinus died at Heidelberg, 18th March 1871. See *Briefwechsel zwischen J. und W. Grimm, Dahlmann, und Gervinus* (ed. by Ippel, 1885).

Geryon, a fabulous three-headed being, possessing herds of splendid oxen, and said to be the son of a king of Hesperia. He figures in the story of Hercules.

Gesangbuch. See Hymnology.

Gesenius, Friedrich Heinrich Wilhelm, one of the greatest of German orientalists and biblical scholars, was born at Nordhausen, 3d February 1786, studied at Helmstedt and Göttingen, and at Halle in 1810 became extraordinary, in 1811 ordinary, professor of Theology. Here he lectured for more than thirty years, broken only by the closing of the university during the war of liberation (1813–14), and by lengthened visits to France and England in 1820, to England and Holland in 1835. Among his pupils were Von Bohlen, Hoffmann, Hupfeld, Rödiger, Tuch, Vatke, and Benfey. He died October 23, 1842. His first great work was his *Hebräisches u. Chaldäisches Handwörterbuch* (1810–12; 10th ed. revised by Muhlau and Volck, 1886; Eng. trans. by Tregelles, 1846–52). His *Hebr. Elementarbuch*, consisting of the *Hebräische Grammatik* (1813; 24th ed. by Kautzsch, 1885) and the *Hebräisches Lesebuch* (1814; 11th ed. by Heiligstedt, 1873), has contributed enormously to the knowledge of the Hebrew language, not only in Germany, but through translations also in England and America. Later works are his *Kritische Gesch. d. Hebr. Sprache u. Schrift* (1815), *De Pentateuchi Samaritani Origine, Indole, et Auctoritate* (1815), *Grammatisch-kritisches Lehrgebäude d. Hebr. Sprache* (1817), and a new translation of and commentary on Isaiah (1820–21). His greatest work is the monumental *Thesaurus philologico-criticus Linguæ Hebrææ et Chaldææ Veteris Testamenti*, of which the first part was published in 1829, but which was completed only in 1858 by Professor Rödiger. Many of the results of the rationalising method of interpreting the Old Testament, which characterises all the works of Gesenius, have been unable to stand the test of progressive modern biblical science. He has certainly been surpassed by Ewald in insight into the genius of the Hebrew language, and its bearing on the interpretation of Hebrew life and thought, as well as in all that qualifies the critic for a true historical, æsthetical, and religious appreciation of the literature preserved to us in the Old Testament. Yet his intense devotion to his favourite studies, and the advance which he made beyond all his predecessors in the establishment of more certain principles of Hebrew philology, undoubtedly entitle him to be regarded as having constituted a new epoch in the scientific study of the Old Testament. A fine sketch of his life was published at Berlin in 1843.

Gesner, Konrad von, a Swiss naturalist, sometimes called the German Pliny, was born at Zurich, 26th March 1516. All his life long he was passionately devoted to the pursuit of knowledge, especially knowledge of the natural sciences. His early studies, in medicine, natural history, and Greek and Latin literature, were prosecuted at Zurich, Strasburg, Bourges, and Paris. Returning home in 1535, he earned his living by teaching, until in 1537 he was appointed professor of Greek at Lausanne. This chair, however, he exchanged four years later for that of Physics and Natural History at Zurich, where he taught and practised as a physician until his death, on 13th December 1565. He was also an indefatigable writer of books, and in the course of his life published no less than seventy-two works, besides leaving at his death eighteen others in progress. His *Bibliotheca Universalis* (1545) contained the titles of all the books then known in Hebrew, Greek, and Latin, unpublished as well as published, with criticisms and summaries of each; its second part, *Pandectarum sive Partitionum Universalium Libri XXI.*, came out in 1548–49. His next undertaking, by far the greatest of his literary works, was the *Historia Animalium* (1551–58). The first book treats of viviparous quadrupeds, the second of oviparous animals (tortoises, lizards, &c.), the third of birds, and the fourth of fishes and aquatic animals. Two other books, never completed, were to have contained the history of serpents and insects. In this work, which will ever remain a monument of his untiring industry, he aimed at bringing together all that was known in his time concerning every animal. But botany was probably the section of natural history with which he had the greatest practical acquaintance. He had collected more than five hundred plants undescribed by the ancients, and was arranging the results of his labours in this department for a third *magnum opus* at the time of his death. He appears to have been the first who made the great step towards a scientific classification of distinguishing genera by the fructification. He also wrote on other branches of science, as medicine, mineralogy, and philology. See Hanhart's *Gesner* (1824). Johann Matthias Gesner (1691–1761), a distinguished classical scholar, editor, and educationist, published texts of Quintilian, Pliny, the *Scriptores Rei Rusticæ*, and several chrestomathies.

Gesneraceæ, a sub-order of Scrophulariaceæ, including about 700 species, mostly herbs, chiefly of tropical America. They are frequently noted for the beauty of their flowers, notably Gloxinia, Achimenes, and other common inmates of our greenhouses. *Fieldia africana*, however, yields the so-called African Teak. Of the closely allied Crescentiaceæ, the Calabash Tree (q.v.) is of most importance.

Gessler, the name given to the tyrannical governor in the story of William Tell (q.v.).

Gessner, Salomon, a German pastoral poet, who also painted and engraved landscapes, was born at Zurich, 1st April 1730. His life was spent as a bookseller in his native town, where he died, 2d March 1788. In 1754 he published *Daphnis*, a conventional bucolic, sentimental, sweetly insipid, lifeless, and unreal. This was followed two years later by a volume of *Idyls* and by *Inkel und Yariko*. His *Tod Abels* (the Death of Abel), a species of idyllic heroic prose poem, which was published in 1758, although the feeblest of his works, had the greatest success, and helped to make its author's name known throughout Europe. Gessner's landscape-paintings are all in the conventional classic style. But his engravings are of real merit; some of them are said to be worthy of the first masters. In 1772 he published a second volume of *Idyls*, and a series of letters on landscape-painting.

Gesta Romanorum ('the deeds of the Romans'), the title of a collection of short stories and legends, in the Latin tongue, widely spread during the middle ages, but of the authorship of which little is known save that it took its present form most likely in England about the end of the 13th or the beginning of the 14th century. The stories are invariably moralised, and indeed the edifying purpose throughout is the sole unifying element of the collection. The title is only so far descriptive as the nucleus of the collection consists of stories from Roman history, or rather pieces from Roman writers, not necessarily of any greater historical value than that of Androcles and the lion from Aulus Gellius. Moralised mystical and religious tales, as well as other pieces, many of ultimate oriental origin, were afterwards added, and upon them edifying conclusions hung but awkwardly, bringing the whole up to about 180 chapters. Oesterley supposes its origin to have been English: the claims to its authorship of the Benedictine prior at Paris, Petrus Berchorius (died 1362), or of a certain Helinandus, may safely be set aside. The style and narrative faculty displayed deserve but little commendation, but the book has a unique interest as at least the immediate source of many stories that have filled a large place in literature. It is enough to mention the stories 'Of Feminine Subtlety' (120), retold in verse by Hoccleve; 'Of the Coming of the Devil, and of the Secret Judgments of God' (80), the story of Parnell's *Hermit;* 'Of Women who not only betray secrets, but lie fearfully' (125), the story of the sixty black crows, the foundation of Dr Byrom's clever poem, *The Three Black Crows;* 'Of too much Pride, and how the Proud are frequently compelled to endure some notable humiliation' (59), a story of the Emperor Jovinian, the same as that of King Robert of Sicily as versified by Longfellow; 'Of the Transgressions and Wounds of the Soul' (102), the same as 'The Leech of Folkstone' in the *Ingoldsby Legends;* 'Of Mental Constancy' (172), a version of the romance of *Guy of Warwick;* and 'Of Ingratitude' (25), and 'Of Constancy' (66), together supplying the groundwork of Rossetti's poem, *The Staff and Scrip.* Here also may be found what are substantially the same stories as Chaucer's *Man of Lawes Tale*, and Shakespeare's *King Lear* and *Merchant of Venice.* One tale, 'Of the Game of Schaci' (166), is a somewhat obscure description of the game of chess. The longest story, 'Of Temporal Tribulation' (153), is that of the adventures of Apollonius of Tyre, his wife and daughter, as in Gower's *Confessio Amantis*, and in *Pericles.* Gower, however, took it from the *Pantheon* (end of the 13th century) of Godfrey of Viterbo. Enough has been said to show that great part of the stories belong alike in form and substance to the ancient story-stock of Europe, and hence the book must be studied side by side with the romance of *Barlaam and Josaphat*, the *Disciplina Clericalis* of Petrus Alphonsus, the *Otia Imperialia* of Gervase of Tilbury, Voragine's *Golden Legend*, the *Speculum Historiale* of Vincent of Beauvais, and the medieval fables connected with the name of Æsop, no less than with such works of literary elaboration as the *Arabian Nights*, the *Talmud*, the *Fabliaux*, the *Decameron*, and the *Canterbury Tales.*

The stories in the *Gesta Romanorum* are mostly bald and inartistic, seldom if ever relieved by a touch of pathos or a gleam of humour, and never by any chance reaching the region of the really dramatic; yet they have a rare literary charm of their own in their utter naïveté and artlessness, as well as in the beautiful simplicity of their moralisations, based on a piety that questions nothing or finds relief in an unfathomed mysticism. Some of the best stories are those that gird at the weaknesses or faults of women—a direction in which monkish wit was ever prone to turn.

The modern form of the *Gesta Romanorum* is, as has been said, a collection of 181 stories, first printed about 1473, but no MS. corresponding exactly to which now exists. The first printed edition was issued at Utrecht in 150 chapters; the second, forming the standard text, within 181 chapters, at Cologne. Although both of these are undated, Oesterley proves that their publication falls between 1472 and 1475. An edition in English was printed by Wynkyn de Worde (1510–15), from MSS. differing widely from those reproduced in the early printed Latin versions. Oesterley divides the numerous MSS. into three groups or families: (1) the English group, written in Latin, the best representative of which has 102 chapters, of which 72 are found in the standard text; (2) the group of German and Latin MSS., represented by an edition printed in German at Augsburg in 1489; and (3) a group of MSS. represented by the standard text, influenced by distinct collections of stories, as Robert Holkot's *Moralisationes Pulchræ in Usum Prædicatorum* and the like. The striking diversity between the MSS. in England and the printed collections led Douce to believe that there were two distinct collections of stories, one of German, the other of English origin. Oesterley's conclusion is that this *Gesta* was originally compiled in England, that it passed quickly to the Continent, was there altered considerably before being printed, and that both the two first printed editions were compiled from several MSS. The second (the standard) form was the largest, and, reaching England before any of the native MSS. had been printed, became accepted as the standard form for the printed text, spite of its many divergences from the MSS. that still existed.

An English version by the Rev. C. Swan was printed in two volumes in 1824; in a revised form, by Wynnard Hooper, in Bohn's 'Antiquarian Library,' in 1877. Sir F. Madden edited *The Early English Versions of the Gesta Romanorum* for the Roxburghe Club in 1838, Mr Sidney J. H. Herrtage for the Early English Text Society in 1879. Critical editions of the Latin text have been edited by A. Keller (Stuttgart, 1842), and H. Oesterley (Berlin, 1872), the last with a masterly introduction. See also the Dissertation in Warton's *History of English Poetry*, and in vol. ii. of Douce's *Illustrations of Shakespeare;* but these must not now be followed implicitly.

Gestation, the retention of the mammalian embryo in the uterus. The period of gestation—i.e. between the fertilisation of the ovum and the extrusion of the fœtus—varies greatly, from about 18 days in the opossum and 30 in the rabbit to about 280 in man and 600 in the elephant. Robert Chambers in his *Vestiges of Creation* emphasised the importance of prolonged gestation as a factor of evolution, and it is certain that the more highly evolved mammals have longer periods of pregnancy than the lower. The size of the animal, the number of offspring at a birth, and the degree of their maturity at birth have also to be considered: thus, the gestations of cow and sheep last about 280 and 150 days respectively, those of mare and bitch about 350 and 60 days, those of giraffe and kangaroo about 420 and 40 days respectively. In the Marsupials, where the placental union between mother and offspring is still undeveloped, the birth is almost always very precocious, but in most cases the young are stowed away after birth in the external pouch. The lowest mammals—duckmole and Echidna—are oviparous. See FŒTUS, MAMMALS, PLACENTA, PREGNANCY, REPRODUCTION.

Getæ, a people of Thracian extraction, who are first mentioned in history as dwelling on the right bank of the Danube, but who in the middle of the 4th century B.C. crossed that river and settled in

Transylvania and Wallachia. They were conquered by Darius Hystaspes in 515 B.C., and then accompanied him in his campaign against the Scythians. Both Alexander the Great, in 335, and Lysimachos, in 292, made attempts to subdue them, but neither was successful. During the first half of the 1st century B.C. they became politically united with the Dacians, a cognate race who had settled in their territories. The Getæ, as distinct from the Dacians, sided with Octavius against Antony, and during the greater part of the 1st century after Christ continued to harass the Roman legions. In 106 B.C. the Dacians and Getæ were subdued by Trajan, their country being added to the empire. Subsequently the Getæ became fused with the Goths (q.v.), who invaded their lands, and afterwards carried many of them with them in their westward migrations.

Gethsemane (Heb. *gath*, 'a wine-press,' and *shemen*, 'oil'), the scene of our Saviour's agony on the night before his Passion, was a small farm or estate at the foot of Mount Olivet, somewhere on the east slope of the Kedron valley, and rather more than half a mile from the city of Jerusalem. Attached to it was a garden or orchard, a favourite resort of Christ and his disciples. The place is not now exactly known, but an enclosure with a few old olive-trees is pointed out to travellers as the site of the garden.

Gettysburg, capital of Adams county, Pennsylvania, built on several hills, 50 miles by rail SSW. of Harrisburg. It contains a Lutheran college (1832) and seminary (1826). Pop. 3230. Gettysburg was the scene of one of the great battles of the civil war, on 2d and 3d July 1863, when General Meade gained a hard fought victory over the Confederate General Lee. Near the town there are numerous monuments commemorating incidents of the battle; and in the national cemetery is a national monument of granite, 60 feet high.

Geulincx, or GEULINCX, ARNOLD, a Dutch philosopher, one of the disciples of Descartes (q.v.), and a leading exponent of the speculative doctrine known as Occasionalism. Very little that is authentic is known about his life. He was born at Antwerp in 1625; for twelve years, from 1646, he lectured successfully at Louvain, was then deposed for some reason not ascertained, and, after living at Leyden in great distress, was in 1665 appointed professor of Philosophy there, but died four years later. His ideas are expounded in books entitled *Saturnalia*, *Logica*, *Ethica*, published in his lifetime, and in *Annotata praecurrentia ad Cartesii Principia* (1690) and *Metaphysica Vera* (1691), which appeared after his death. The salient point of his teaching is an endeavour to explain the relations which obtain between soul and body, the mutual interaction of which under stimulus he ascribed to divine intervention and preordained arrangement. See works by Grimm (Jena, 1875), Pfleiderer (Tüb. 1882), and Samtleben (Halle, 1886).

Geum, a genus of Rosaceæ, sub-order Potentilleæ, distinguished from Potentilla by the hardened hooked styles which crown the carpels, so that the fruit becomes a bur. Two species are common natives of Britain, *G. urbanum*, the Wood Avens or Herb Bennet, and *G. rivale*, Water Avens, the former with erect yellow flowers, and the latter with nodding flowers of a brownish hue. The former grows in hedges and thickets, the latter in wet meadows and woods, and sometimes even in very alpine situations. The so-called *G. intermedium* is usually regarded as a mere hybrid of these two species. Both are aromatic, tonic, and astringent, and of old repute among herbalists; the rootstock of the former was formerly gathered in early spring to impart its clove-like flavour to ale, and is still used in the preparation of liqueurs. *G. canadense*, the Chocolate Root or Blood Root of North America, has some reputation as a mild tonic.

Water Avens (*Geum rivale*).

Geyser, or GEYSIR (Icelandic *geysa*, 'to burst out violently'), is the name applied to eruptive fountains of steam and hot water met with in various quarters of the globe, especially in Iceland, North America, New Zealand, Tibet, and the Azores. The water of these springs is often clear and limpid, but frequently thick, turbid, and heavily charged with mud; examples of the latter have been discovered in Burma. The mineral substances held in solution in geysers are numerous and varied in character, including sodium chloride, calcium sulphate, sodium sulphate, calcium carbonate, magnesium carbonate, ammonium carbonate, potassium chloride, silica, various silicates, sulphur, ferric oxide, aluminium oxide, carbonic acid, &c. Some of these substances, becoming separated from the water by evaporation, form basin-shaped cones of solid matter, from the midst of which the geyser rises, and in course of time assume proportions of considerable magnitude; the cones are principally of a calcareous or siliceous character, the latter, known as siliceous sinter or geyserite, being apparently most common. It is either a compact, dull, sometimes, but less frequently, translucent laminated substance, or shapeless, porous mass, occasionally impregnated with ferric oxide, which produces a red or pink tinge.

Geysers occur only in regions where volcanic activity has but lately become dormant, but is not yet altogether extinct, and the phenomena connected with them are connected with seismic action. Bunsen and Descloizeaux have formulated a theory explaining the phenomena, which has met with wide acceptance and is generally preferred to the views held by such authorities as Bischof, Mackenzie, Herschel, Von Nidda, and others. Shortly stated, the explanation put forward by the two former is as follows, founding upon observations made at the Great Geyser of Iceland. In the tube of this geyser, and near the surface, the water temperature is 212° F., increasing downwards until a degree of heat is reached very far above the boiling-point of water under ordinary atmospheric pressure, fluidity being maintained by the weight of the column of water above. The water in the tube or funnel of the geyser communicates with an area directly acted upon by the source of the subterranean heat, such communication being attained by means of a lateral chamber or passage. Far down in the funnel steam is generated, which, rising immediately into the cooler water above, is condensed, heating the upper water until the boiling-point is reached, and relieving the pressure upon the lower portions of the greatly heated water, which flashes into steam. This alteration passing down the funnel results in closely following explosions of steam, shooting the whole contents high into the air, and producing the well-known outward manifestations associated with geysers.

These manifestations are most frequently met with where large masses and thicknesses of rock have undergone extensive crushing, fracture, and compression which may account not only for the subterranean heat, but also for the presence of the underground passages apparently necessary for the production of a geyser.

The geysers of the Yellowstone region are probably the most picturesque and wonderful in the world: on the Firehole River alone, within an area of 30 sq. m., there are probably 50 geysers, throwing columns of water to a height of from 50 to 200 feet, while smaller jets rise occasionally to 250 feet. The 'Old Faithful' geyser, in this region, throws up a column of water 6 feet in diameter to a height of 100 to 150 feet, at intervals of about an hour. Near the north entrance to the National Park, also, are the hot springs of the Gardiner River; here the 'White Mountain,' built up of terraces of white calcareous deposits, rises to a considerable height, with a diameter of 150 yards at the top. The terraces are of varying width, measuring from a few inches to many feet, and are separated one

'Old Faithful' Geyser.

from another by small cliffs of from 6 inches to 10 or 12 feet in height. From the top of the mound water is continually trickling down over these rocks and terraces, the precipitate left behind ever slowly adding to the bulk of the cone. As the streams fall from terrace to terrace they are received into several natural basins, and, as the water gradually cools as it nears the bottom, bathers are enabled to choose almost any temperature of water, and these natural baths are largely taken advantage of. See YELLOWSTONE.

The geysers of Iceland are situated within sight of Mount Hekla, 16 miles north of Skalholt, and are the hottest springs in Europe, as well as the best known in the world. Norwegian writers of the 12th century noted their presence, but it was nearly 600 years later before native authors described or noticed them in any way. The principal geysers of this region are known as the 'Great Geyser' or 'Roarer,' and the 'Stroker' or 'Churn.' The former consists of the usual mound of siliceous incrustations, almost circular and about 40 feet in height, the top forming a basin measuring 52 feet by 60 feet, lined with a pure white siliceous coating of considerable hardness. A tube, 74 feet in length, communicates with the interior of the geyser, the upper opening being in the centre of the basin. There can be no doubt that the geyser has itself built up the tube and mound—a work, according to careful calculations and experiments undertaken on the spot in 1859 by Commander Forbes, which must have occupied over eleven centuries. Probably the best account of this geyser is that of Henderson, who visited the district in 1814. The 'Churn' has an irregular opening, not more than eight feet wide, the tube decreasing in width as it descends, permitting one to look down upon the boiling water 20 feet below without much danger to the observer. If the orifice be temporarily choked by throwing in turf the water will soon burst through, rising 60 feet into the air, carrying the obstruction along with it, and diffusing dense clouds of steam in all directions.

The geysers of New Zealand attained celebrity principally on account of the beautiful terraces associated with them, and have often been described and figured. Unfortunately, volcanic activity manifested itself throughout the region in June 1886, resulting in much loss of life and property, and in the destruction of the terraces. The basins connected with these geysers, catching the overflow of water, are, like those of the Yellowstone region, largely used by bathers, and are much resorted to by invalids. Froude and Martin may be consulted for descriptions of typical New Zealand geysers. See MINERAL WATERS.

Gfrörer, AUGUST FRIEDRICH, a German historian, was born at Calw, in the Black Forest, 5th March 1803. He studied theology at Tübingen, next lived at Lausanne, Geneva, and Rome, becoming on his return in 1828 a *Repetent* at Tübingen, and in 1830 librarian at Stuttgart. He now gave himself with much zeal to historical studies, of which the first fruit was his *Philo und die Judisch-Alexandrinische Theosophie* (1831), followed by *Gustav Adolf* (1835), a work which aimed at bringing into prominence the political rather than the religious rôle of the great Swedish king. His *Geschichte des Urchristenthums* (1838) was called forth by the greater work of Strauss. In his *Allgemeine Kirchengeschichte* (1841–46), coming down to 1305, he first spoke out his admiration for the polity of the Roman Church. Soon after he was called to the chair of History at Freiburg, and in 1848 he was sent to the Frankfort parliament, where he was one of the most decided adherents of the party called the *Grossdeutschen*, the fanatical opponents of Prussia. He formally went over to Rome in 1853, and thereafter was distinguished by his large share of the intolerance of the convert, although all the while he was never a dogmatically satisfactory Catholic. He died at Carlsbad, July 6, 1861. His most important other works were *Geschichte der Karolinger* (1848) and *Papst Gregorius VII.* (1859–61). All his works are learned, often perversely so; his conclusions are too often more ingenious than sound.

Ghadames. See GADAMES.

Ghara is the name sometimes given to the united stream formed by the junction of the Sutlej

and the Beas, from Endrisa to the junction with the Chenab, when it becomes known as the Panjnad. The distance between the two points of confluence is about 300 miles.

Ghasel, or GHAZEL, a favourite form of lyrical poetry among the Turks and Persians, which may be either erotic and bacchanalian, or allegorical and mystical.

Ghâts, or GHAUTS (in English, 'gates, passes, or landing-stairs'), EASTERN and WESTERN, two converging ranges of mountains, which run parallel with the east and west coasts of southern India, and meet at an angle near Cape Comorin. (1) The Eastern Ghâts commence in the vicinity of Balasor, a little north of the Mahanadi, and run through Madras, with an average height of 1500 feet, for the most part at a distance of from 50 to 150 miles from the coast. They are nowhere a watershed on any considerable scale, being penetrated and crossed by nearly all the drainage of the interior. (2) The Western Ghâts stretch from the valley of the Tapti, in about the same latitude as Balasor, to their junction with the kindred ridge, and on to Cape Comorin itself. Though they are generally far more continuous and distinct than the Eastern Ghâts, yet they are sharply divided by the gap of Palghat—the northern section measuring 800 miles in length, and the southern 200. Their general elevation varies from about 3000 feet to upwards of 7000; the peak of Dodabetta, in the Nilgiri hills, is 8760 feet above sea-level. The opposite faces of these mountains differ very remarkably from each other. Landward, there is a gradual slope to the tableland of the Deccan; seaward, almost perpendicular precipices, speaking generally, sink at once nearly to the level of the sea, with only a comparatively narrow strip between them and the shore. This peculiarity, along with the heavy rainfall brought by the south-west monsoon, causes, more particularly towards the south, that singular feature of the country which is known as the 'backwaters' (see COCHIN). The Western Ghâts are a watershed, for not a single stream of any magnitude finds its way through them. Their vast primeval forests display some of the most magnificent scenery in India, and supply abundance of the finest timber. In the south there is a railway from Beypur to Madras, finding a comparatively easy access to the interior by the Palghât valley. In the north, near Bombay, two railways scale the precipitous face of the Western Ghats. Of these the line up the tremendous ravine of the Bhor Ghât, 40 miles SE. of Bombay, is regarded as one of the greatest engineering feats ever accomplished in India. The railway rises by a lift of 15½ miles to a height of 1831 feet, twisting round the mountains on narrow ledges that are often half embankment, or that rest on high vaulted arches, and passing through tunnels that aggregate 2535 yards. Besides 8 viaducts there are 18 bridges and 58 culverts, and the average gradient is 1 in 48.

The name GHÂTS is also applied to the flights of steps, whether intended as landing-places or as bathing-stairs, which line the river-banks in towns and places of pilgrimage in northern and central India. Most great rivers, and especially the Ganges, possess many ghâts; but they are also built on the margins of lakes, as at Pushkar and Sagar, or even of tanks. The uniformity of the long lines of steps is often broken by shrines or temples, built either close to the water's edge or at the top; and on these steps are concentrated the pastimes of the idler, the duties of the devout, and much of the necessary intercourse of business. The ghâts of Benares (q.v.), Hardwar, Panharpur, and of Maheswar, on the Nerbudda, are noteworthy either for their number or beauty; while Cawnpore, Sadullapur, the ruined city of Gaur, and other places possess noted 'burning ghâts' for purposes of cremation. See also Fergusson's *Handbook of Architecture*.

Ghazali, ABU MOHAMMED AL-, known in the West as ALGAZEL, a Moslem theologian who, in the 11th century, struck a serious blow at the scholastic philosophy of the Arabians. Born at Tus in Khorasan in 1058, he studied in his natal city and at Nishapur, being especially nurtured on the principles of Sufism (q.v.). When thirty-three years old he was appointed by the grand-vizier of Bagdad to a chair of philosophy in the university of that city. But four years later he set off for Mecca; then spent ten years lecturing at Damascus; and finally went on to Jerusalem and Alexandria, where also he taught with signal success. In the end, however, he returned to Tus, where he founded a Sufic college and dedicated the remainder of his life, until 1111, the year of his death, to religious and philosophic contemplation. The most notable of his numerous works are *Opinions of the Philosophers* and *Tendencies of the Philosophers*, this latter virtually an introduction to the more famous *Destruction of the Philosophers*, in which he challenges the methods and conclusions of the current scholasticism of Arabian philosophy. He also wrote a commentary on the ninety-nine names of God, several ethical treatises, and various other works on religion and philosophy. Several of his works have never yet been published.

Ghaziabad, a town and important railway junction in Meerut district, North-west Provinces of India, 28 miles SW. of Meerut, with barracks, and a considerable trade in grain, hides, and leather. Pop. 10,059.

Ghazipur, a city of India, capital of a district of the same name in the North-west Provinces, stands on the left bank of the Ganges, 44 miles NE. of Benares. The city, which stretches along the Ganges for about 2 miles, contains the ruins of the Palace of Forty Pillars, and a marble statue by Flaxman to Lord Cornwallis, who died here in 1805. Ghazipur is the headquarters of the Government Opium Department for the North-west Provinces, all the opium from these provinces being manufactured here, and there is some trade in sugar, tobacco, rose-water, and coarse long-cloth. Pop. (1891) 44,970.—The *district*, of which Ghazipur is the administrative headquarters, has an area of 1462 sq. m., and a pop. of 1,077,909.

Ghazni (also spelt *Ghizni* and *Ghuznee*), a fortified town of Afghanistan, stands below a spur of a range of hills, at an elevation of 7729 feet, 84 miles SW. of Kabul, on the road to Kandahar and at the head of the Gomal route to India. It is a place of considerable commercial importance. The climate is cold, snow often lying for three months in the year. Nevertheless, wheat, barley, and madder are grown in the vicinity. Its population is estimated at about 10,000. From the 10th to the 12th century Ghazni was the capital of the empire of the Ghaznevids (see below); it then fell into the hands of the sultan of Ghûr, and enjoyed a second period of splendour. Having shortly afterwards been captured by the Mongols, it rapidly fell into decay. It remained, however, subject to the descendants of Baber, the Mongol rulers of Delhi and Agra, down to 1738, when it was taken by Nadir Shah of Persia, and at his death was incorporated in the kingdom of Afghanistan. During the 19th century it figured in the British wars against the Afghans, having been stormed by Lord Keane in 1839, and again in 1842 by the Afghans, but retaken the same year by General Nutt. In the neighbourhood of Ghazni

there are several ruins and monuments of its former greatness, such as the tomb of Mahmud, Mahmud's dam in the Ghazni River, numerous ruin-heaps north-east of the town, and many Mohammedan shrines. The celebrated gates of Somnath (q.v.) were kept at Ghazni from 1024 to 1842.

Ghaznevid Dynasty.—About the middle of the 10th century a lieutenant of the Samanid ruler of Bokhara seized upon Ghazni, and, dying in 977, left it to his son-in-law, Sebuktagin, who during a reign of twenty years extended his sway over all modern Afghanistan and the Punjab. But it was under his son Mahmud (997–1030) that the Ghaznevids reached their highest point of splendour and renown. This prince repeatedly invaded India, and carried his conquering arms as far as Kurdistan and the Caspian on the west and to Samarkand on the north. He was the first monarch in Asia to assume the title of sultan. His descendants had a keen struggle to maintain themselves against the Seljuks, who had seized upon Khorasan, Balkh, Kharezm, and Irak during the reign of Mahmud's son Masaud (1030–42), and against their jealous rivals the princes of Ghûr (q.v.). Bahram Shah, ruler of Ghazni from 1118 to 1152, was at length driven from his capital by the latter, and retired to the Punjab. There his grandson, Khosrau Malek, the last of the dynasty, made Lahore his capital. This town was, however, taken by the prince of Ghûr in 1186, and with this the Ghaznevid dynasty came to an end.

Ghee (*Ghi*), a kind of clarified butter used in many parts of India, and generally prepared from the milk of buffaloes. The fresh milk is boiled for an hour or more; it is then allowed to cool, and a little curdled milk, called dhye, is added to promote coagulation. The curdled mass is churned for half an hour; some hot water is then added, and the churning continued for another half-hour, when the butter forms. When the butter begins to become rancid, which is usually the case after a few days, it is boiled till all the water contained in it is expelled, and a little dhye and salt, or betel-leaf, is added; after which it is put into closed pots to be kept for use. It is used to an enormous extent by the natives of many parts of India, but is seldom relished by Europeans.

Gheel, a colony for the insane, in Belgium, 26 miles ESE. of Antwerp by rail. It is an oasis in a desert, a village and commune (20 miles in circumference) in a comparatively fertile spot, inhabited and cultivated by 11,000 peasants, in the midst of an extensive sandy waste, called the Campine (see BELGIUM). Here in 800 A.D. St Dymphna, an Irish princess, is said to have been beheaded by her father, for resistance to his incestuous passion. Pilgrims, the sick, the sorrowful, and the insane, visited the shrine of the Christian virgin; the last were restored to sanity and serenity. About 1300 insane persons are lodged with the citizens of this community, and are controlled and employed by them, and this without recourse to walls or other asylum appliances, and with little coercion of any kind. The quieter sufferers reside generally one in each family in the village, the more excited in separate farmhouses at some distance on the confines of the commune, while those requiring medical treatment are temporarily accommodated in the infirmary in Gheel. The support of the patients is in most cases guaranteed by the state. See works in French on Gheel and the 'Gheel system' by Duval (1867) and Peeters (1879).

Ghent (Flem. and Ger. *Gent*, Fr. *Gand*), a city of Belgium, capital of the province of East Flanders, is situated at the confluence of the Lys and the Scheldt, 34 miles by rail NW. of Brussels. It is divided by canals into 26 islands, connected by 270 bridges, and is encompassed with gardens and meadows, while the former walls have been converted into pleasant promenades. It is in general well built; but in the older part it still retains several quaint and picturesque houses. Among the chief buildings are the cathedral of St Bavon, of the 13th and 14th centuries, counted amongst the finest churches of the country, and containing the 'Adoration of the Lamb,' by the brothers Van Eyck; the belfry-tower (1183–1339), 280 feet high, or 375 with the iron spire of 1855; the new citadel (1822–30); the hôtel-de-ville (1480–1628), one of the most florid specimens of flamboyant Gothic in Belgium; the Palais de Justice (1835–43), with a peristyle of the Corinthian order; the university (1816), the Béguinage (q.v.), and the Academy of Painting. The cotton, woollen, and linen manufactures are the chief industries. Leather, lace, and sugar are also manufactured, and there are foundries, machine-works, breweries, &c. Specially noteworthy is the floriculture of Ghent. By the Great Canal, which flows into the Scheldt, Ghent is united with the sea, and it can receive into its docks vessels drawing 17 feet of water. The harbour is capable of holding 400 vessels, new docks having been opened in 1881. Ghent is very rich in charitable and public institutions. With the university are united a school for civil engineers, another for arts and sciences, and the former town-library. Pop. (1846) 102,977; (1891) 150,223; (1896) 159,218.

Ghent, whose patron-saint, the soldier-monk Bavon, is said to have died in 655, was certainly a prosperous city in the time of the Merovingian Franks. In 1007 it was given by the emperor to Count Baldwin IV. In the 12th century it was made the capital of Flanders. And under the counts it continued to prosper and increase, until, in the 14th century, it was able to send 80,000 men into the field, and to withstand, single-handed, the power of the count backed up by the king of France. The wealth of the citizens of Ghent, and the unusual measure of liberty which they enjoyed, encouraged them to resist with arms any attempt to infringe upon their peculiar rights and privileges. This jealous and turbulent spirit is exemplified in the famous insurrection of Jacob van Artevelde (q.v.), and other instances. John of Gaunt, i.e. Ghent, was born here in 1340. For many years the city maintained a vigorous resistance against the Dukes of Burgundy; and having rebelled against Charles V., their successor, in 1540 it was deprived of its privileges. From this time the town began to decay, and under Philip II. the Inquisition struck a yet deadlier blow at its well-being. In the various wars of which the Netherlands has been the battle-ground, Ghent has suffered severely, and has been frequently taken, especially in the 18th century. Falling into the hands of the French at the Revolution, it was made the capital of the department of the Scheldt, till its incorporation in the kingdom of the Netherlands in 1814, in which year was signed the peace of Ghent between Britain and America. In 1830 it fell to Belgium. See FLANDERS; also Van Duyse, *Gand, monumental et pittoresque* (Brussels, 1886).

Gherardesca. See UGOLINO.

Ghetto (Ital.), the Jews' quarter in Italian cities, to which they used to be strictly confined. The ghetto of Rome, instituted in 1556 by Pope Paul IV., was removed in 1885 and following years, its demolition having been rendered necessary by the new Tiber embankment. The term is also employed to indicate the Jews' quarters in any city. See JEWS.

Ghi. See GHEE.

Ghibellines. See GUELPHS.

Ghiberti, LORENZO, an Italian goldsmith, bronze caster, and sculptor, was born at Florence about 1378. He was apprenticed to his stepfather, a skilful goldsmith, and also acquired dexterity in drawing, painting, and modelling. In 1400 he executed a noble fresco in the palazzo of Pandolfo Malatesta at Rimini. Along with other artists, he was next chosen (1401) by the Florentine guild of merchants to compete for the execution of a gate in bronze, to match that executed by Andrea Pisano in the baptistery in 1336. The subject of the design was 'The Sacrifice of Isaac,' to be executed in bas-relief as a model for one of the panels. The judges selected Ghiberti's design, both on account of the art and beauty of its conception and the delicacy and skill of its execution. When Ghiberti had completed this great work (1424) his fellow-citizens entrusted him with the execution of another gate, to emulate the two already adorning the baptistery. This second gate, finished in 1452, contains ten reliefs on a larger scale, the subjects in this case also being wholly biblical. The mingled grace and grandeur of these compositions is beyond all praise; though his treatment of bas-relief has been condemned as wrong in principle. On the two gates he spent fifty years of most patient labour. Not the least of Ghiberti's merits was the success that attended his efforts to break down the conventionalism that before his day hampered the free development of sculptural art. Among his other works may be mentioned the sepulchral monuments of Dati in Santa Maria Novella, and of the Albizzi in Santa Croce at Florence, executed about 1427; a bronze relief in the Duomo, representing St Zenobius bringing a dead child to life (1440); and between 1414 and 1422 bronze statues of St John the Baptist, St Matthew, and St Stephen for the church of Or San Michele. Ghiberti died at Florence, 1st December 1455. See Perkins, *Ghiberti et son Ecole* (Paris, 1885).

Ghika, HELENA, Princess Koltzoff-Massalsky, better known by her literary pseudonym of *Dora d'Istria*, was a daughter of Prince Michael Ghika, was a niece of two hospodars of Wallachia, and was born at Bucharest, 22d January 1829. The family from which she was descended was Albanian in origin, and from the time of George Ghika, hospodar of Wallachia in 1660, gave many princes and eminent men to the principalities: see ROUMANIA. Profoundly instructed in the classics under the care of George Pappadopoulos, the princess added to her acquirements by travels through Germany, France, and Italy an extensive knowledge of modern languages and literature. At fifteen she commenced a translation of the *Iliad* into German, and not long after wrote several pieces for the theatre. On her unhappy marriage in 1849 with Prince Koltzoff-Massalsky she accompanied her husband to the court of St Petersburg; but from 1855 she resided mainly at Florence, where she died, 22d November 1888. Her first important work, *La Vie Monastique dans l'Eglise Orientale*, was published in 1855. Other works were: *La Suisse Allemande* (1856); *Les Femmes en Orient* (1860); *Excursions en Roumelie* (1863); *Aux Bords des Lacs Helvétiques* (1864); *Des Femmes, par une Femme* (1864); *Gli Albanesi in Rumenia; Storia dei Principi Ghika* (1873); *La Poesie des Ottomans* (1873). She wrote much for the *Revue des Deux Mondes* and other journals and magazines of France, Italy, Belgium, and Switzerland; and her writings on Albanian literature stirred up a notable literary and national movement amongst the Albanians. She was made a member of several learned societies, and an honorary citizen of the Greek kingdom. See Cecchetti, *Dora d'Istria* (1871), and an article in *Scribner's Magazine* for December 1878.

Ghilan', a province of Persia, the western portion of the narrow strip of country lying between the Elburz range and the Caspian Sea, is separated from Russian Caucasia on the north-west by the river Astara. Area, 4251 sq. m. Owing to the lowness of the land, the province is subject to frequent inundations, and during great part of the year is little better than a swamp. There are dense forests, chiefly of oaks, maples, ashes, limes, &c., and a tropical luxuriance of vegetation. Extensive plantations of fruit and mulberry trees are grown, these last for the production of silk. The soil is extremely fertile, bearing barley, wheat, fruits, and great quantities of rice. Animal life is abundant. The fisheries in the Caspian are very productive. The population, estimated at 150,000 to 250,000, are principally of Iranian descent, mingled with Kurdish and Turkic immigrants, and nearly all are Shiite Mohammedans. The climate is moist, changeable, and unhealthy. Storms are very violent.

Ghilzais, an Afghan tribe. See AFGHANISTAN.

Ghirlandajo, DOMENICO CURRADI, nicknamed Il Ghirlandajo ('the garland-maker'), Italian painter of the early Florentine school, was born in 1449 at Florence. As a youth he was apprenticed to a goldsmith, probably his father, the maker of metal garlands; and it was not until his thirty-first year that he became known as a painter. He painted principally frescoes, and in his native city. The church of Ognisanti there contains from his hand a St Jerome and a Last Supper (1480); the Palazzo Vecchio, the Apotheosis of St Zenobius (1481–85); the church of S. Trinità, six subjects from the life of St Francis (1485) and an altar-piece, the 'Adoration of the Shepherds' (now in the Florentine Academy); the choir of S. Maria Novella, a series illustrating the lives of the Virgin and the Baptist (1490). Between 1482 and 1484 he painted for Pope Sixtus IV., in the Sistine Chapel at Rome, the excellent fresco 'Christ calling Peter and Andrew,' and about the same time two pictures in the chapel of St Fina at San Gimignano. Besides these he also executed some easel pictures of great merit, as 'Adoration of the Magi' (1488), in the church of the Innocenti at Florence; the 'Visitation of the Virgin' (1491), in the Louvre; the 'Adoration of the Virgin by the Saints,' in the Uffizi at Florence; and 'Christ in Glory,' at Volterra. All these are painted in tempera, and are not free from a certain hardness of outline and of colour. His frescoes are generally characterised by excellent composition, good knowledge of perspective, strength in the outlines, except in the case of feet and hands, and propriety of expression, but often show a tendency to crudeness in colouring. Ghirlandajo inaugurated at Florence the practice of introducing into his sacred pictures portraits of his contemporaries; and the same fondness for local colour is frequently discernible in his landscape backgrounds. He also executed mosaics, that of the 'Annunciation' in the cathedral of Florence being especially celebrated. He died at Florence, 11th January 1494. Michel Angelo was for a time one of his pupils.

His son RIDOLFO (1483–1561) was a painter of considerable merit, whose best pictures are those which show the influence of Fra Bartolommeo and Raphael, such as two scenes from the 'Life of St Zenobius' (in the Uffizi), 'Ascension of the Virgin' (at Prato), and 'Adoration of the Shepherds' (1510, at Pesth).

Ghizeh. See GIZEH.

Ghizni. See GHAZNI.

Ghoorkhas. See GOORKHAS.

Ghost-moth (*Hepialus humuli*), a species of moth very common in many parts of Britain, of which the caterpillar, popularly known as the 'Otter,' often commits great ravages in hop gardens, devouring the roots of the plants. It feeds also on the roots of the nettle, burdock, and some other plants. The moth belongs to a small family (Hepialidæ), often popularly called *Swifts* from

Ghost-moth (*Hepialus humuli*):
caterpillar (*a*) and chrysalis (*b*).

their rapid flight. The antennæ are short, the wings long and narrow, the entire size about two inches across. The male is entirely of a satiny white colour above, and the female yellowish and reddish with darker markings; both sexes are brown on the under side. They are to be seen flying about in the twilight, generally over lawns and pastures, not unfrequently in churchyards. From this circumstance, and from the white colour of the males and their sudden disappearance in the imperfect light on their folding their wings or rising above the level of the spectator's eye (so that the brown part is turned towards him), they derive their name. The caterpillar, which is sometimes two inches long, is yellowish-white, with scattered hairs. It spins a large cylindrical cocoon among the roots on which it has been feeding, and then becomes a chrysalis. Two other common species of generally similar habit are *H. lupulinus* and *H. hectus*.

Ghosts. See Apparitions, Haunted Houses.

Ghoul. See Vampire.

Ghur, or Ghore, a mountainous district of western Afghanistan, lying south-east from Herât and north-west from Kandahar. Roughly speaking, it coincides with the ancient Paropamisus and the medieval Gharshistan. It is a region, however, about which next to nothing is known, except that it is inhabited by Hazaras and Eimaks, and since 1845 has been included in the territory of Herât.

Ghûri, a dynasty of princes who had the seat of their empire in the country of Ghûr, and ruled over Persia, Afghanistan, northern Hindustan, and Transoxiana. We first read of Ghûr in connection with Mahmud of Ghazni and his son Masaud, the latter of whom subjugated the region in 1020. About a century later Malik Izzuddin made himself ruler of all the Ghûr country. His son, Alauddin Jahansoz (the Burner), fell upon Ghazni, and took it and burned it to the ground. This prince's nephews, Ghiyassuddin and Muizuddin, established their power in Khorasan and Ghazni. The latter, crossing the Indus, then conquered successively the provinces of Multan (1176), Lahore (1186), and Ajmere (1190), and, in the course of the next six years, all Hindustan as far south as Nagpur and eastward to the Irawadi. It is from this epoch that the preponderance of Islam in Hindustan is dated. On the death of Muizuddin the Indian states asserted their independence, the power of the Ghûri being confined to Ghûr, Seistan, and Herât. This last feeble remnant was taken from them by the Shah of Kharezm about 1215. Some thirty years later the Ghûr princes managed to revive something of their former power at Herât, which they retained by sufferance from the Mongols down to 1383, when the city was captured by Timur, and the Ghûr sovereignty came to an end.

Gianibelli, Federigo, a military engineer, born at Mantua about 1530. During the siege of Antwerp by the Spaniards in 1585 he destroyed, by means of an explosive ship, a bridge built by the latter across the Scheldt. Proceeding to England on the capitulation of Antwerp, he rendered great service in the preparations for resisting the Armada of 1588, by fortifying the Thames shore and devising the plan of sending the fire-ships into the enemy's fleet. He is said to have died in London, but when is not known.

Giannone, Pietro, an Italian antipapal historian, was born 7th May 1676, at Ischitella, a village of Capitanata, in Naples. A barrister by profession, practising at Naples, he spent twenty years in the composition of a *magnum opus*, entitled *Storia Civile del Regno di Napoli* (4 vols. 1723). It led to his banishment; he took refuge at Vienna, Venice, and Geneva successively. Whilst at Geneva he published a bitter attack upon the papal pretensions in a work entitled *Il Triregno*. Then, being decoyed into Savoy in 1736, he was arrested and confined at Turin until his death, 7th March 1748. A collection of *Opere Postume* appeared after his death (Lausanne, 1760); and in 1859 Mancini issued his *Opere Inedite* (2 vols. Turin).

Giants. A giant (Gr. *gigas*) is an individual whose stature and bulk exceed those of his species or race generally. Until the beginning of the 19th century it was universally believed that giants, of a size far exceeding those who are exhibited in our times, formerly existed, either as nations or as individual specimens. This belief was based on the asserted discovery of colossal human bones, on supposed scriptural evidence, and on the evidence of various ancient and medieval authors.

A reference to the first volume of Cuvier's *Ossements Fossiles* will show that the bones of elephants, rhinoceroses, mastodons, &c. have been exhibited and accepted as evidence of prehistoric giants. Even so good a naturalist as Buffon fell into this popular delusion, and figured the bones of an elephant as the remains of human giants. Isidore Geoffroy Saint-Hilaire, in his *Histoire des Anomalies de l'Organisation*, notices several of the most famous of these cases.

The Scripture evidence, when carefully examined, does not amount to much. The Hebrew words *nephilim* and *gibborim*, which are translated *giants* in the Authorised Version ('nephilim' and 'mighty men' in the Revised Version), were apparently not giants in our sense of the word. The height of Og, king of Bashan, is not given; we are only told the length of his bed. The height of Goliath is put at six and a half cubits, but by Josephus and the Septuagint at four cubits and a span—say 8 feet 9 inches. The Anakim and other tall races referred to in Scripture need not have been of superhuman size.

The classical evidence is abundant, but obviously untrustworthy. Thus, besides Homer's allusions to

cyclopes, giants, Polyphemus, and like legendary races or persons. Plutarch relates that Sertorius had the grave of Antæus, at Tingis in Mauretania, opened, and 'finding there his body, full 60 cubits long, was infinitely astonished, ordered the tomb to be closed, gave his confirmation to the story, and added new honours to the memory of the giant.' Pliny reports that an earthquake in Crete disclosed the bones of a giant 46 cubits in length, who was held by some to be Orion, and by others Otus. Descending to more certain evidence, there is no doubt that a height of between 8 and 9 feet, and probably of more than 9 feet, has been attained. There is a skeleton in the Museum of Trinity College, Dublin, 8 feet 6 inches in height; that of Charles Byrne (1761–83), in the museum of the College of Surgeons of England, is 8 feet 2 inches; and that of a giant in the museum at Bonn is 8 feet; and the actual body with the soft parts attached was probably two or three inches longer than the skeleton. Byrne, for example, measured 8 feet 4 inches after his death, as we find recorded in the *Annual Register*, vol. xxvi. p. 209. He has often been confounded with Patrick Cotter or O'Brien (1761–1806), whose height is variously given at 7 feet 10 inches, and 8 feet 7 inches. The Scottish giant in the service of Frederick William I. of Prussia measured 8 feet 3 inches, and was notable in his regiment of giants. The Chinese giant Chang claimed to have grown from 7 feet 8 inches to 8 feet between his first appearance in London (1865) and his second (1880). The Austrian Josef Winkelmaier (1865–87) was 8 feet 9 inches. Popular belief seems right in treating the Patagonians as the tallest race of men; the mean height being ascertained to be about 5 feet 11 inches.

It appears (1) that giants are of rarer occurrence than dwarfs; (2) that giants are usually of a lymphatic temperament, and of a very delicate complexion, often deformed, and almost always badly proportioned; that their muscles are flabby, and their voice weak; while dwarfs are often perfectly well proportioned, and are strong for their size; (3) that giants are never long-lived—Byrne died at twenty-two, Magrath at twenty, Winkelmaier at twenty-two—while dwarfs seem to attain the full ordinary period of human existence; (4) that while giants usually exhibit a want of activity and energy, and are feeble both in body and mind, dwarfs are in general lively, active, and irascible. We know little of the causes which occasion the excessive development or the arrested growth on which the production of giants and dwarfs depends. See DEFORMITIES.

Mythological Giants and Dwarfs.—Giants play a part in the mythology of almost all nations of Aryan descent. The Greeks, who represented them as beings of monstrous size, with hideous countenances, and having the tails of dragons, placed their abode in volcanic districts, whither they were fabled to have been banished after their unsuccessful attempt upon heaven, when the gods, with the assistance of Hercules, imprisoned them under Ætna and other volcanoes. Their reputed origin, like the places of their abode, points to the idea of the mysterious electrical and volcanic convulsions of nature, which they obviously typify; and, in accordance with this view, they are said to have been of mingled heavenly and earthly descent, and to have sprung from the blood that fell from the slain Ouranos upon the earth, Ge, which was their mother. In the cosmogony of the northern nations, giants occupy a far more important place than the Greeks assigned to them, for here the first created being was the giant Ymir, called also 'Aurgelmir' or 'the ancient Chaos,' the progenitor of the Frost-giants (Hrimthursar), among whom dwelt the All-Father before the creation of heaven and earth. How Ymir the first giant arose, and what came of the giants and their home Jotunheim, is an integral part of Scandinavian Mythology (q.v.). The giants have been held to be personifications of the powers of nature, of barbarism in conflict with a more civilised régime, and of heathen powers in conflict with Christianity. Even the boys' tale of *Jack the Giant-killer* has been held to have originated in the struggle of the Christian Welsh with the pagan Anglo-Saxons. Swift's Brobdingnagians are the best known of modern imaginary giants. See Wood's *Giants and Dwarfs* (1868); Tylor's *Primitive Culture* (1871); Bollinger, *Zwerg- und Riesenwuchs* (1884); and Max. Mayer, *Die Giganten und Titanen in der Antiken Sage und Kunst* (1889).

Giants' Causeway (deriving its name from a legend that it was the commencement of a road to be constructed by giants across the channel to Scotland) is a sort of natural pier or mole, of columnar basalt, projecting from the northern coast of Antrim, Ireland, into the North Channel, 7 miles NE. of Portrush by an electric tramway (1883). It is part of an overlying mass of basalt, from 300 to 500 feet in thickness, which covers

The Honeycomb, Giants' Causeway.

almost the whole county of Antrim, and the eastern part of Londonderry. The basalt occurs in several beds, interstratified with protrusions of whin-dyke. Several of these beds are more or less columnar, but three layers are remarkably so. The first appears at the bold promontory of Fair Head; its columns exceed 200 feet in height. The other two are seen together rising above the sea-level at Bengore Head, the lower one forming the Giants' Causeway. It is exposed for 300 yards, and exhibits an unequal pavement, formed of the tops of 40,000 vertical closely-fitting polygonal columns, which in shape are chiefly hexagonal, though examples may be found with 5, 7, 8, or 9 sides. There is a single instance of a triangular prism. The diameter of the pillars varies from 15 to 20 inches. Each pillar is divided into joints of unequal length, the concave hollow at the end of one division fitting exactly into the convex projection of the other. The rock

is compact and homogeneous, and is somewhat sonorous when struck with a hammer. The Grand Causeway is itself formed of three causeways, the Little, Middle or Honeycomb, and the Grand Causeway. On the Little Causeway may be seen an octagon, pentagon, hexagon, and heptagon all together; on the Middle Causeway is the famous Wishing Chair, with two arms and a back, on a platform where the columns rise to a height of about 10 feet. On the Grand Causeway are pointed out the Lady's Fan, an exact arrangement of five perfect pentagons surrounding a heptagon; the Keystone of the Causeway—a sunk octagon; and the single triangle. At the starting-point is the Giants' Loom, an imposing row of columns 30 feet high, each intersected by about thirty joints; to the left is the Giants' Well, to the right the Giants' Chair.

The best way to see the Causeway is to walk along it under the cliffs, and next over them, but he who would see the full grandeur of this wonderful strip of coast must row along it eastward as far as the Pleaskin. The 'Short Course' includes a visit to Portcoon and Runkerry Caves and the Causeway only; the 'Long Course' extends westward to the caves, and eastward to the Horseshoe Bay beyond Pleaskin and under Benbane Head. The various inlets and points along the coast, passed in order, are Portnabo, separated by the Stookan Rocks from Portganniay; next, after the Giants' Causeway proper is passed, Portnoffer, closed on the east side by the Giants' Organ, a row of imposing pillars the appearance of which at once explains their name; after Roverin Valley Head is turned, Port Reostan, opening up into the Amphitheatre, fringed with cliffs 350 feet high, and reaching its eastern horn in the Chimney Point, the lofty stacks of whose rocks are said to have been fatally mistaken for the chimneys of Dunluce Castle by a Spanish Armada ship. The next bay is Spanish Bay, with the Spanish Organ, shut in by Benanouran Head, 400 feet high, between which and Pleaskin Head are the reefs called the Giants' Eyeglass and the King and his Nobles. The Pleaskin rises to a height of 400 feet, and is the noblest of all the Causeway cliffs. The prospect is unrivalled from Hamilton's Seat near its top, so named from the Rev. Dr Hamilton of Derry, one of the first to call attention to the Causeway (1786). Beyond it is the Horseshoe Harbour and the group of rocks called the Nurse and Child. After rounding Benbane Head we come in sight of Bengore Head (367 feet), below which the coast slopes more rapidly southward past the pillars known as the Four Sisters, the Giants' Peep-hole, and the Giants' Granny to the ruins of Dunseverick Castle.

Giants' Kettles, the name given in Norway to vertical pot-shaped, smooth-sided hollows excavated in rocks, usually filled up with rounded boulders, water-worn stones, gravel, and other detritus. They are believed to have originated under the great glaciers or continuous *mer de glace* which formerly covered wide regions of northern Europe (see BOULDER-CLAY, GLACIAL PERIOD, PLEISTOCENE SYSTEM). They have probably been formed by water descending from the surface of the ice through *moulins* or glacial chimneys—setting stones and boulders in rapid rotation. They are thus comparable to the pot-holes which are so common a feature in the beds of rapid streams, particularly in the neighbourhood of waterfalls, where the stones have a gyratory motion imparted to them by the irregular movements of the water. As they rotate they gradually wear away the rock, and produce more or less steep-sided cavities. Giants' kettles occur in connection with the glacial deposits of many other countries besides Norway; as, for example, in Prussia.

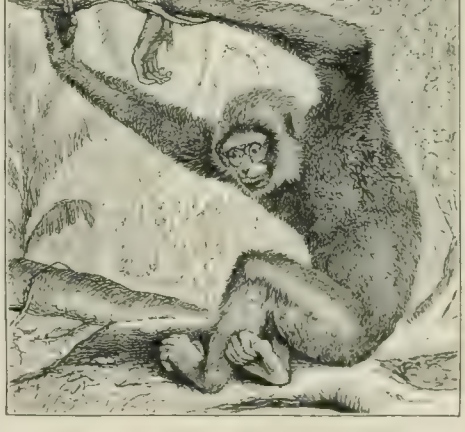
Giaour, the Italian spelling (popularised by Byron) of a Turkish word, applied by the Turks to all who reject Mohammedanism, especially to European Christians. By some it is said to be derived from the Persian *gâwr*, 'infidel;' by others to be a corrupt form of the Arabic *Kafir*, 'infidel' (cf. *Kaffirs*, the African people, and the *Guebres*, q.v.).

Giarre, a town of Sicily, in the province of Catania, on the eastern slope of Mount Etna. Its harbour is Riposto. The surrounding district produces excellent wine. Pop. 8300.

Giaveno, a town of Piedmont, 17 miles W. of Turin, with cotton and jute spinning and paper works. Pop. 6500.

Gibbet, a sort of gallows on which the bodies of criminals who had been guilty of particularly atrocious crimes were by order of the courts of justice suspended after execution, encased in an iron frame, near the spot where the crime was committed. This was done for the purpose of striking terror into the evil-minded, and of affording 'a comfortable sight to the relations and friends of the deceased.' The practice, first recognised by law in 1752, was finally abolished in 1834.

Gibbon (*Hylobates*), a genus of tail-less anthropoid apes, natives of the East Indies. They are nearly allied to the orangs and chimpanzees, but are of more slender form, and their arms so long as almost to reach the ground when they are placed in an erect posture; there are also naked callosities on the buttocks. In this respect they differ from the other Anthropoid Apes (q.v.), and are allied to some of the Catarrhini; in other respects also the Gibbons are the lowest among the anthropoid apes, and connect them with the Catarrhini. The gibbons are inhabitants of forests, their long arms enabling them to swing themselves from bough to bough, which they do to wonderful distances, and with extreme agility. They cannot, however, move with ease or rapidity on the ground. The conformation of the hinder extremities adds to



The Active Gibbon (*Hylobates agilis*).

their difficulty in this, whilst it increases their adaptation to a life among the branches of trees, the soles of the feet being much turned inwards. None of the gibbons are of large size. There are some eight or ten species. The Common Gibbon, or Lar Gibbon (*H. lar*), is found in some parts of India, and in more eastern regions. The Active Gibbon (*H. agilis*), found in Sumatra, is particularly remarkable for the power which it displays of flinging itself from one tree to another, clearing

at once, it is said, a distance of forty feet. The Wow-wow (*H. lar*) is a gibbon found in Malacca and the Sunda Isles. *H. leucogenys* is from Siam. The Hoolock (*H. Hoolock*) is a native of the Garrow Hills. The Siamang (*H. syndactylus*), a Sumatran species, differs from the rest of the genus in having the first and second fingers of the hinder extremities united together up to the second joint; it resembles the Orang (q.v.), and differs from the true gibbons in having a large air-sac opening into the windpipe. All the gibbons are of gentle disposition, and easily domesticated. At present the gibbons are confined to south-eastern Asia and some of the larger islands bordering upon the continent, but it is possible that *Dryopithecus* found fossil in Tertiary strata of the south of France, of the size of a man, is referable to the same group. See figure of the skeleton at ANTHROPOID APES.

Gibbon, EDWARD, the greatest of English, perhaps of all historians, was born at Putney, near London, 27th April (8th May in new style) 1737, the eldest, and sole survivor beyond the years of infancy, of the seven children of Edward Gibbon and of Judith Porten. In Gibbon's case the task of the biographer has been made easy by his own autobiography, which comes down to within five years of his death, and which with all its exquisite art is perhaps the most veracious example of its class in the English tongue. Gibbon's parents were both of good family; his father, a country gentleman of a nature kindly but weak, and himself the son of an able financier who lost a fortune in the South Sea bubble, and made another before his death. The boy's childhood was sickly from a strange nervous affection, which contracted his legs alternately and caused excruciating pain. The very preservation of his life he ascribed to the more than maternal care of his aunt, Catherine Porten, whose devotion he repaid with a constant affection. His studies were desultory perforce, and two miserable years at Westminster was all the regular schooling that he got. After his fourteenth year his weakness began to disappear, and his father, without permitting him to wait until he was adequately prepared, carried him off to Magdalen College, and entered him as a gentleman commoner, April 3, 1752. At no period in its history had Oxford reached such a depth of degeneracy. 'The fellows of my time,' says Gibbon, 'were decent easy men who supinely enjoyed the gifts of the founder; their days were filled by a series of uniform employments; the chapel and the hall, the coffee-house and the common room, till they retired, weary and well satisfied, to a long slumber. From the toil of reading, or thinking, or writing, they had absolved their conscience; and the first shoots of learning and ingenuity withered in the ground, without yielding any fruits to the owners or the public. . . . Their conversation stagnated in a round of college business, Tory politics, personal anecdotes, and private scandal; their dull and deep potations excused the brisk intemperance of youth; and their constitutional toasts were not expressive of the most lively loyalty for the house of Hanover.' Such was the atmosphere into which Gibbon was flung at the age of fifteen, 'with a stock of erudition which might have puzzled a doctor, and a degree of ignorance of which a schoolboy might have been ashamed,' and here he spent fourteen months—'the most idle and unprofitable of my whole life; the reader will pronounce between the school and the scholar.' From his childhood he had been fond of religious disputation, and his incursions into the bewildering mazes of a great controversy made him at sixteen a convert to the Church of Rome, and shut the gates of Oxford upon him. His father next placed him under the care of the poet and deist Mallet, but by his philosophy the young enthusiast was 'rather scandalised than reclaimed.' To effect his cure from popery he was next sent to Lausanne to board in the house of a Calvinist minister, M. Pavilliard, a poor but worthy and intelligent man, who judiciously suggested books and arguments to his young charge, and had the satisfaction of seeing him reconverted to Protestantism. Gibbon tells us that 'the various articles of the Romish creed disappeared like a dream; and after a full conviction, on Christmas-day 1754, I received the sacrament in the church of Lausanne. It was here that I suspended my religious inquiries, acquiescing with implicit belief in the tenets and mysteries which are adopted by the general consent of Catholics and Protestants.' He lived for nearly five years in M. Pavilliard's house, respecting the minister, and enduring with greater or less equanimity the 'uncleanly avarice' of his wife; and here he began and carried out with rare steadfastness of purpose those private studies in French literature, but especially in the Latin classics, which, aided by his prodigious memory, made him a master of erudition without a superior, and with hardly an equal. Here also he fell in love with Mademoiselle Suzanne Curchod, the beautiful and accomplished daughter of the obscure minister of Crassy, who lived to become the wife of the great French minister and financier, M. Necker, and the mother of the gifted Madame de Staël. He found on his return to England that his father would not hear of the 'strange alliance,' and in the calm reflection of thirty years later he adds, 'After a painful struggle I yielded to my fate; I sighed as a lover, I obeyed as a son; my wound was insensibly healed by time, absence, and the habits of a new life. My cure was accelerated by a faithful report of the tranquillity and cheerfulness of the lady herself, and my love subsided in friendship and esteem.' They remained constant friends in later life, and the former lover during a visit to Paris (1765) visited her daily in her salon, 'soft, yielding, humble, and decorous to a fault,' as Madame Necker describes him in a familiar letter to a friend.

Gibbon returned to his father's house in 1758. He was well received, and 'ever after continued on the same terms of equal and easy politeness.' He became much attached to his step-mother, and the two 'easily adopted the tender names and genuine characters of mother and son.' He brought with him the first pages of a little book which at length he published in 1761 in French, under the title of *Essai sur l'Étude de la Littérature*. He had joined the Hampshire militia, and for the next two and a half years led a wandering life of military servitude as a captain—an irksome discipline, but one which he admits was not unprofitable to him. 'The discipline and evolutions of a modern battalion gave me a clearer notion of the phalanx and the legion; and the captain of Hampshire grenadiers (the reader may smile) has not been useless to the historian of the Roman empire.' Meantime he revolved within his mind many projects for a historical work, and, the militia being disbanded, visited Paris and Lausanne, and extended his travels into Italy. 'It was at Rome,' he tells us, 'on the 15th of October 1764, as I sat musing amidst the ruins of the Capitol, while the barefooted friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started into my mind. But my original plan was circumscribed to the decay of the city rather than of the empire; and though my reading and reflections began to point towards that object, some years elapsed, and several avocations

intervened, before I was seriously engaged in the execution of that laborious work.'

One of the projects taken up and abandoned after two years' preparatory studies was a history of Switzerland in conjunction with his friend Deyverdun, with whom also he planned and actually printed two volumes of a periodical work entitled *Mémoires Littéraires de la Grande Bretagne* (1767–68). Another work was his anonymous *Critical Observations on the Sixth Book of the Æneid*, a bitter attack upon the paradox advanced in Warburton's *Divine Legation*, that Virgil in the sixth book of his *Æneid*, in the visit of Æneas and the Sibyl to the shades, allegorised his hero's initiations, as a lawgiver, into the Eleusinian mysteries. In 1770 his father died, leaving his affairs in disorder, from which Gibbon within two years contrived to extricate himself, and settle in London. In 1774 he entered parliament as member for the borough of Liskeard at the beginning of the struggle with America, and 'supported with many a sincere and silent vote the rights, though not, perhaps, the interest of the mother-country.' He sat afterwards also for Lymington, altogether for eight sessions, without ever summoning courage to speak. In a letter (1775) to Holroyd (the future Lord Sheffield) he writes: 'I am still a mute; it is more tremendous than I imagined; the great speakers fill me with despair; the bad ones with terror.' His constant support of government was rewarded in 1779 by a post as one of the Lords Commissioners of Trade and Plantations, which brought a welcome addition to his income of over £700 a year, but of which he was deprived three years later on the suppression of the office through the exertions of Burke.

After the labours of seven years and infinite fastidiousness in its composition, he published the first volume of his *Decline and Fall of the Roman Empire* in February 1776. Its success was immediate, and it was not for some time that the religious world awakened to the insidiously dangerous character of the attack upon Christianity in the 15th and 16th chapters, which while not formally denying the 'convincing evidence of the doctrine itself, and the ruling providence of its great author,' proceed to account for the rapid growth of the early Christian church by 'secondary' or merely human causes—most of them rather its effects. Of these he offered five: (1) the inflexible and intolerant zeal of the Christians; (2) the doctrine of a future life, improved by every additional circumstance which could give weight and efficacy to that important truth; (3) the miraculous powers ascribed to the primitive church; (4) the virtues of the primitive Christians; (5) the union and discipline of the Christian republic. Gibbon was by temper incapable of apprehending spiritual aspirations by sympathetic insight, and he assailed with sneer and innuendo what he did not understand yet instinctively disliked, but feared openly to attack. He was too worldly and altogether too much a true son of his century to estimate aright what was really unworldly; and, moreover, this inability was intensified by his own cold and composed temperament and the reflex effect of his peculiar experiences.

Hume, who was then slowly dying (March 1776), in a characteristic and highly complimentary letter said about these chapters: 'I think you have observed a very prudent temperament; but it was impossible to treat the subject so as not to give grounds of suspicion against you, and you may expect that a clamour will arise.' The prophecy proved true, and Gibbon was ere long assailed by a loud discharge of 'ecclesiastical ordnance,' which he professes to have found but empty sound, 'mischievous only in the intention.' He claims to have helped his assailants to being rewarded in this world. He only deigned to reply when Henry E. Davies of Oxford impugned 'not the faith, but the fidelity of the historian;' still, he would not print his *Vindication* in quarto lest it should be bound and preserved with the history itself. He persevered assiduously with his great work, and had two more volumes ready in 1781. And now, having lost office, and finding it difficult to live easily in London upon his income, he determined to accept Deyverdun's invitation to settle down with him in his house at Lausanne. He started in September 1783, and spent the next four years in the midst of his 6000 volumes, in calm and uninterrupted work, never moving the while a dozen miles out of the town. He had nearly completed the fourth volume before leaving London, the fifth was finished in twenty-one months, the sixth in little more than a year. The conclusion must be told in his own memorable and touching words: 'It was on the day, or rather the night, of the 27th of June 1787, between the hours of eleven and twelve, that I wrote the last lines of the last page, in a summer-house in my garden. After laying down my pen I took several turns in a *berceau*, or covered walk of acacias, which commands a prospect of the country, the lake, and the mountains. The air was temperate, the sky was serene, the silver orb of the moon was reflected from the waters, and all nature was silent. I will not dissemble the first emotions of joy on recovery of my freedom, and, perhaps, the establishment of my fame. But my pride was soon humbled, and a sober melancholy was spread over my mind, by the idea that I had taken an everlasting leave of an old and agreeable companion, and that, whatsoever might be the future fate of my History, the life of the historian must be short and precarious.' A month later he started for England to superintend the printing of the work. The fourth volume took three months; the last two were issued in the May of 1788. He returned immediately to Lausanne, where within a twelvemonth his much-loved companion Deyverdun died—a blow which affected him deeply, and from which indeed he never fully recovered. The state of France filled him with trouble, though it was some solace to have the exiled Neckers beside him at Coppet, near Lausanne. The letters between his old love and himself are creditable in the highest degree to the hearts of both. 'Come to us,' she writes, 'when you are restored to health and to yourself; that moment should always belong to your first and your last friend, and I do not know which of those titles is the sweetest and dearest to my heart.' But his last years were not happy; good living and want of exercise had brought on burdensome corpulency, and he began to be racked with the torture of gout. His aunt had already died in 1786, Deyverdun and other favourite friends had quickly followed, and last came the unexpected death of his dear friend, Lady Sheffield. At once, though travelling was now terrible to him, he made up his mind to go to console Lord Sheffield, and within a month he was with him. After three months' stay at Sheffield Place, and a visit to his aged step-mother at Bath, he came to London, where a few days later he was seized with an attack of dropsy, the result of a rupture which he had neglected for over thirty years. An operation gave temporary relief, and he went again a little into society, but two months later he died, without apprehension or suffering, in St James's Street, London, 16th January 1794.

The monumental work of Gibbon is likely to remain our masterpiece in history. The magnitude of the subject is nobly sustained by the dignity of the treatment, and the whole fabric stands out a marvellous bridge flung by genius and erudition

across the weltering centuries of confusion that separate the old world from the new. The glowing imagination of the writer gives life and vigour to the rounded periods and to the stately and pompous march of the narrative, and all defects of taste disappear in the admiration extorted from the most reluctant reader. Perhaps his most unique merit is his supreme and almost epic power of moulding into a lucid unity a bewildering multitude of details, and giving life and sequence to the whole. His prodigious memory moved freely under a ponderous weight of learning which his quickening imagination fused into a glowing stream of continuous narrative, which is yet, with all its detail, a marvel of condensation. The story of Constantinople is his greatest effort—his treatment of Julian, of Justinian, of the Arabs, and of the Crusades, the most splendid single episodes in our historical literature. He has painted in gorgeous colours all the splendours of the ancient Paganism, and portrayed with matchless force every figure that crossed the stage of history for a thousand years; for the moral beauty of Christianity alone he has no enthusiasm—the heroism of its martyr-witnesses and its saints touches not his imagination nor warms his dramatic sense to life. This elemental defect set aside, few faults of detail have been discovered in his work, the enduring merit of which it may be permitted to summarise in the words of a great modern master of history, whose own studies have followed closely in his track. 'That Gibbon should ever be displaced,' says Mr Freeman, 'seems impossible. That wonderful man monopolised, so to speak, the historical genius and the historical learning of a whole generation, and left little indeed of either for his contemporaries. He remains the one historian of the eighteenth century whom modern research has neither set aside nor threatened to set aside. We may correct and improve from the stores which have been opened since Gibbon's time; we may write again large parts of his story from other and often truer and more wholesome points of view; but the work of Gibbon as a whole, as the encyclopædic history of 1300 years, as the grandest of historical designs, carried out alike with wonderful power and with wonderful accuracy, must ever keep its place. Whatever else is read, Gibbon must be read too.'

Lord Sheffield collected his *Miscellaneous Works* (2 vols. 1796, enlarged ed. 5 vols. 1814). Sir W. Smith's edition of *The Decline and Fall* (8 vols. 1854–55) contains the notes of Guizot and Milman; a new edition, in 7 vols., edited by J. B. Bury, was begun in 1896. In 1897 another Lord Sheffield published the six versions of the Autobiography from which Miss Holroyd pieced together the text till then accepted; and two volumes of the letters were edited by Professor Prothero. See the monograph by J. C. Morison (1878), and Frederic Harrison's address at the Gibbon Commemoration (1895).

Gibbons, GRINLING, sculptor and wood-carver, was born at Rotterdam, 4th April 1648. In 1671 Evelyn found him at Deptford carving on wood Tintoretto's 'Crucifixion;' and on Evelyn's recommendation he was appointed by Charles II. to a place in the Board of Works, and employed in the ornamental carving of the choir of the chapel at Windsor. His works display great taste and delicacy of finish, and his flowers and foliage have almost the lightness of nature. For the choir of St Paul's, London, he executed the foliage and festoons, and those in lime-tree which decorate the side aisles. At Chatsworth, at Burleigh, at Southwick, Hampshire, and other mansions of the English nobility, he executed an immense quantity of carved embellishment; the ceiling of a room at Petworth is regarded as his *chef-d'œuvre*. He also produced several fine pieces in marble and bronze. Among these are the statue of James II., Whitehall; the base of the statue of Charles I., at Charing Cross; and that of Charles II., at the Royal Exchange. He died in London, August 3, 1721.

Gibbons, ORLANDO, one of the greatest of English musicians, was born at Cambridge, 1583, and was probably brought up in the choir of one of the college chapels. His elder brothers, Edward and Ellis, were both eminent organists and composers. The chief events of Gibbons's short life are soon told. On March 24, 1604, he was appointed organist of the Chapel Royal, London. In 1606 he took the degree of Mus.Bac. at Cambridge, and in 1622, at the instance of Camden, that of Mus.Doc. at Oxford. His exercise was the well-known 8-pt. anthem, 'O Clap your Hands.' In 1623 he became organist of Westminster Abbey. In May 1625 he went with the king and court to Canterbury, to await the arrival of Henrietta Maria, and while there, on June 5, died of what appears to have been apoplexy (see the official letter and report of the physicians in the *Athenæum*, November 14, 1885, p. 644). His monument, with a bust, is in the north aisle of the nave at Canterbury, and a portrait is in the music-school, Oxford. His wife's name was Elizabeth Patten; and of their seven children six survived him, two of whom, Christopher and Orlando, were musicians.

Gibbons's reputation as an organist was great; he 'had the best hand in England.' His compositions are not numerous, but most of them are pure gold. The best known are his Morning and Evening Service in F; the anthems, 'O Clap your Hands' and 'God is gone up' (8 pts.), 'Hosanna,' 'Lift up your Heads' (6 pts.), and 'Almighty and everlasting God' (4 pts.); the 5-pt. madrigals, 'The Silver Swan,' 'O that the learned Poets,' and 'Dainty, fine, sweet Bird.' Besides these he left Preces and hymns, a score of anthems, both full and verse; seventeen madrigals, the remainder of the volume published in 1612; nine fantasies for strings (1611); six pieces for the virginals, included in 'Parthenia' (1612), and a few other miscellaneous pieces. These show him to have been not only learned, as all musicians of that time were learned, but animated by grace, dignity, and sentiment, such as were possessed by none of his predecessors in the school. Nothing more noble and spirited was ever written than his 'Hosanna,' nothing more touchingly religious and beautiful than his 'Almighty and Everlasting,' or 'The Silver Swan.' In these exquisite compositions the art disappears, and the sentiment of the words is immediately seized. His Service, for propriety, dignity, and beauty, remains above all that preceded or followed it. It and the anthems named above retain their constant place in English choirs.

With Gibbons the great church school of England came to an end. Byrd had died in 1623, two years before him, and Bull, Weelkes, Dowland, and others of the old giants departed just at this very date. *Felix opportune date mortis, non cuncta videt*—. The great troubles followed very shortly, and the death of the king and the destructions of the Civil War; music was all but extinguished; and the new school began on fresh foundations with the Restoration, in the persons of Pelham Humfrey, Blow, and Purcell. But Orlando Gibbons is the culmination of the ancient musical art of our country, and as long as voices can sing and hearts can delight in real beauty he will remain at the head of the English church school of music. For the full list of his works and other details, see Grove's *Dictionary of Music and Musicians*, i. 594, and iv. 647.

Gibbous, a term signifying 'protuberant,' 'swelling out,' applied to bodies which are double-

convex, and particularly to the moon, when she is within a week of the full.—GIBBOSITY (Lat. *gibbus*, 'humpbacked') is a state of disease characterised by protuberance of a part of the body; chiefly applied to humpback or other distortions depending on disease (Rickets, q.v.) of the spinal column.

Gibeah, a Hebrew word signifying a 'hill,' and giving name to several towns and places in ancient Palestine. *Gibeah of Benjamin*, 4 miles N. of Jerusalem, near Ramah, was the scene of the story of the Levite (Judges, xix.), and was the residence, if not the birthplace, of King Saul. It has been identified with the modern village of Jeb'a.

Gibel. See CARP.

Gibeon, a city of ancient Palestine, a place of great natural strength, on a hill in a fertile plain among the mountains of Benjamin, 5 miles NW. of Jerusalem. At the conquest of Canaan by the Israelites under Joshua, it was inhabited by Hivites. By a clever stratagem the Gibeonites ensured the alliance and protection of the invaders, but, their deceit being afterwards found out, they were reduced to a condition of servitude, being made 'hewers of wood and drawers of water unto all the congregation.' When the five kings of the Amorites besieged Gibeon for having entered into a traitorous compact with the common enemy of all the Canaanites, Joshua hastened to its help, and overthrew the besiegers with great slaughter. It was there that Joshua, in the words quoted from the book of Jashar (Joshua, x. 12), commanded 'the sun to stand still upon Gibeon, and the moon in the valley of Ajalon.' Gibeon is often mentioned in the Old Testament; and on its site there still stands a village with an old church.

Gibraltar (Span. *Gibraltar*), an isolated mass of rock, in the SW. of Spain, rising to an altitude of 1408 feet, 3 miles in length and ¾ mile in average breadth, is situated at the extremity of a low sandy peninsula, which connects it on the north with Andalusia; its most southern headland, Point Europa, is in 36° 2′ 30″ N. lat. and 5° 15′ 12″ W. long. Its western side is washed by the Bay of Gibraltar, called also the Bay of Algeciras; and at the foot of the rock, on this same side, is the town of Gibraltar, which consists of two parts, the South Town, above the dockyard, and the North Town, which has narrow, mean streets, and is inhabited by a motley agglomeration of English, Genoese, Spaniards, Jews, and Moors. In 1892 Algeciras (opposite) was connected with the Spanish railway system. Pop. (1895) 26,184, including garrison of 5034. Amongst public buildings, besides barracks, &c., are the governor's residence, called the Convent—it formerly belonged to the Franciscans; the naval hospital; the Alameda Gardens, stretching between the North Town and the South Town; the signal station, crowning the central eminence of the rock, 1255 feet high; the remains of the ancient Moorish castle, founded in the 10th century; and the lighthouse, on Point Europa, erected in 1841, whose light, 150 feet above the sea, is seen for 20 miles. At the northern base of the rock is the open space called the North Front, extending as far as the British lines; here are the cemetery, the cricket-ground, the racecourse, &c. Between the British and the Spanish lines is the neutral ground, which is uninhabited. On the west side of the rock, south of the Alameda Gardens, are the naval victualling-yard and the naval dockyard. This latter dates from the 18th century, and is protected on the south by a new mole, a quarter of a mile long. The merchant-vessels that visit the town find good anchorage in the Bay of Gibraltar, 8 miles deep by 5 wide. Gibraltar has been a free port since its capture by the British. Until the introduction of steam-vessels it was one of the chief emporiums of the Mediterranean; and its trade is still important—the burden of the vessels entering and clearing is about 5000 ships of 8,500,000 tons (the vast majority British) in a year. Gibraltar ranks among the most important Coaling Stations (q.v.), and harbour improvements were sanctioned by the naval bills of 1895 and 1896. The Spaniards complain of smuggling from Gibraltar. The governor exercises all the functions of the legislative and executive; local affairs are managed by elected commissioners. Since 1842 Gibraltar has been the see of an Anglican bishop.

'Every spot from which a gun can be brought to bear is occupied by cannon, which oftentimes quaintly peep out of the most secluded nooks, among geraniums and flowering plants, while huge piles of shot and shell, some of enormous size, are stowed away in convenient places, screened from an enemy's fire, but all ready for use.' The approaches from the north, across the flat isthmus connecting the rock with Spain, and from the sea, the south and south-west sides, are guarded by a great number of very powerful batteries,

mounted with guns of the heaviest calibre, and by fortifications so strong in themselves and in their relative bearing on each other, that the rock may fairly be regarded as impregnable so long as a sufficient garrison remains for its defence, and sufficient provision for the maintenance of the troops and any civil inhabitants suffered to reside there during hostilities. Moreover, a sea-wall, defended by a system of flanking bastions, and strengthened by a breakwater, constructed in 1846, extends along the western base of the rock from the new mole to the old. Towards the north and north-west the defences are aided by a series of fortified galleries, some 2 to 3 miles in length. These consist of an upper and a lower tier: in the former are two large halls; one, St George's, is 50 feet long by 35 wide. Port-holes are cut in these galleries for cannon at intervals of 12 yards.

The eastern side is so precipitous as to be altogether secure from assault. The annual cost to the imperial government of maintaining the garrison and fortifications averages about £330,000. In these days, however, of steam-ships and heavy long range guns, the military importance of Gibraltar has certainly diminished.

The rock is composed of Jurassic limestone resting on a Silurian basement. The surface presents a bare and repellent aspect, principally due to the absence of trees; nevertheless, there are grassy, wooded glens in the nooks of the mountain. The rocky mass is perforated by numerous caverns, some of which penetrate for several hundred feet into the rock. The largest, called the 'Hall of St Michael,' is 220 feet long, 90 wide, and 70 high, and its floor is connected with the roof by stalactite pillars ranging up to 50 feet in height, linked by arches on the top. The entrance lies about 1100 feet above the sea. Large stalactites are found in most of the other caverns, and interesting fossils abound throughout the peninsula. Gibraltar is the only place in Europe where monkeys live wild (see BARBARY APE); but, after an epidemic of smallpox in 1894, only fifty remained.

Gibraltar has been known in history since the days of the early Phœnician navigators. The Greeks called it *Calpe*, and it and Abyla (now Ceuta) opposite formed the Pillars of Hercules, long held to be the western boundary of the world. We have no certain information of its natural strength being made available for defensive or aggressive purposes until the year 711 A.D., when the Saracen leader Tarik, a general of the Calif Al-Walid, crossing from Africa for the invasion of the Visigothic kingdom, fortified it, as a base of operations, and a ready point of access from the Barbary coast. From this chieftain it took the name of Gebel el-Tarik, or Hill of Tarik, of which Gibraltar is a corruption. One of the old towers of his early castle still remains. In 1302 Ferdinand II. of Castile won it from the Moors; but in 1333 it fell to the army of the king of Fez, whom a siege by the Castilian monarch failed to dislodge. In 1410 Yussuf, king of Granada, possessed himself of the fortress, which, however, was finally wrested from the Moors by the Spaniards in 1462, and by them refortified and strengthened in every way. A combined Dutch and English force, however, under Sir George Rooke and Admiral Byng, and the Prince of Hesse-Darmstadt, after a vigorous bombardment, and a landing in force, compelled the governor to capitulate in 1704.

Since 1704 Gibraltar has remained continuously in the possession of the British, in spite of many desperate efforts on the part of Spain and France to dislodge them. Before the victors had been able to add to the defences, their mettle was severely tried by two attacks in 1704–5. The most memorable of the sieges to which Gibraltar has been exposed commenced 21st June 1779, when, Britain being engaged in the struggle with its revolted colonies, and at the same time at war with France, Spain took the opportunity of joining the coalition, and made a most determined attempt to subdue the garrison of this isolated fortress. It was, however, defended with heroic valour by General Eliott (see HEATHFIELD) and 5000 men, including 1100 Hanoverians. Several times the defenders were on the point of starvation. On 26th November 1781, in a desperate midnight sally, the British succeeded in destroying the more advanced of the enemy's lines on the land side, in setting fire to many of his batteries, and in blowing up his principal depôt of ammunition. At length in July 1782 the Spaniards were reinforced by the French, the Duc de Crillon took command of the assailants, and preparations were made for the grand assault. Additional batteries were constructed on the land side, and floating-batteries built to bombard the fortress from the sea. Covered boats destined to disembark 40,000 troops were at the same time prepared. The effective force with which General Eliott had to withstand these efforts comprised about 7000 men. The attack commenced on the 8th September by a furious bombardment simultaneously on all sides, and it was kept up without intermission until the 14th; but by means of red-hot balls and incendiary shells the otherwise invulnerable floating-batteries were all set on fire and destroyed, and the attack was completely repulsed, with a loss to the heroic garrison of only 16 killed and 68 wounded. Since then the fortress has enjoyed immunity from attack. See Drinkwater's *History of the Siege of Gibraltar* (1785); Gilbard's *History of Gibraltar* (1881); H. M. Field, *Gibraltar* (New York, 1889).

Gibraltar, STRAITS OF (anciently the *Straits of Hercules*), connect the Mediterranean with the Atlantic. They narrow toward the east, their width between Point Europa and Cape Ceuta being only 15 miles, at the western extremity 24; the narrowest part measures 9 miles. The length (from east to west) is 36 miles. A constant surface-current which runs in from the Atlantic is counterbalanced by an under-current from the Mediterranean.

Gibson, JOHN, sculptor, was born a market-gardener's son, at Gyffin, near Conway, North Wales, in 1790, but from his tenth year was brought up at Liverpool, where at fourteen he was apprenticed to cabinet-making. This he exchanged for carving, first in wood, then in stone, his love of art having manifested itself strongly even while he was a mere boy at school. He found a patron in Roscoe; and, proceeding to Rome in 1817, became a pupil of Canova, and after his death of Thorwaldsen. Gibson then fixed his residence in that city, and very seldom revisited his native country. At first he was a faithful follower of Canova, whose graceful softness he made his own. But, advancing to the study of the antique, he finally rose to ideal purity and a thorough realisation of the grace of form. Amongst his finest works may be mentioned 'The Hunter and Dog,' 'Theseus and the Robber,' 'Amazon thrown from her Horse,' the two bas-reliefs of 'The Hours leading the Horses of the Sun' and 'Phaethon driving the Chariot of the Sun,' and 'Hero and Leander.' In these the most characteristic trait is perhaps that of passionate expression; they are, moreover, thoroughly classical, and are marked by a refined and noble severity. The innovation of tinting his figures (e.g. his Venus), which he defended by a reference to Grecian precedents, has not commended itself to the public taste. Among his portrait-statues, those of Huskisson, Dudley North, Peel, George Stephenson, and Queen Victoria are the best. In 1833 he was elected an associate, in 1836 a member of the Royal Academy, to which he left a representative collection of his works. He died at Rome, 27th January 1866. See Life by Lady Eastlake (1869).

Gibson, THOMAS MILNER, English politician, was born at Trinidad, 1806, and educated at Trinity College, Cambridge, where he graduated in 1830. He entered parliament for Ipswich as a Conservative in 1837; but shortly afterwards became a convert to Liberalism, and was returned for Manchester (1841). He had previously distinguished himself by his advocacy of free trade; during the succeeding five years he occupied a prominent position among the orators of the Anti-corn-law League. When the Whigs came into office, in July 1846, he was made a privy-councillor and vice-president of the Board of Trade, but resigned

office in April 1848. On the outbreak of the war with Russia he espoused the doctrines of the 'Manchester school,' or 'Peace party.' Whilst sitting for Ashton-under-Lyne (1857–68) he was appointed (1859) president of the Board of Trade, and also *ad-interim* president of the Poor-law Commission. The former office he held until 1866. It was mainly through Gibson's instrumentality that the advertisement duty was repealed in 1853, the newspaper stamp duty in 1855, and in 1861 the paper duty. From his defeat at Ashton-under-Lyne in 1868 till his death at Algiers, 25th February 1884, he took no prominent part in public life.

Giddiness. See VERTIGO.

Gidding. See FERRAR, NICHOLAS.

Giddings, JOSHUA REED, an American statesman, was born in Athens, Pennsylvania, 6th October 1795, removed with his parents to Ohio in 1806, was called to the bar in 1820, and elected to the Ohio legislature in 1826. He sat in congress from 1838 to 1859, and was one of the most distinguished, outspoken, and aggressive leaders of the anti-slavery movement. In 1842 he was censured by a congressional vote (125 to 69) for his agitation, but at once resigned and appealed to his constituents, and was re-elected by a large majority. In 1861 he was appointed consul-general in Canada, and died at Montreal, 27th May 1864. He published a volume of speeches (1853), *The Exiles of Florida* (1858), and *The Rebellion: Its Authors and Causes* (posthum. 1864).

Gideon, the name of the greatest of all the judges of Israel. He was the youngest son of Joash, of the house of Abiezer, and lived with his father at Ophrah, in Manasseh. During his youth Israel was sunk in idolatry and sloth, and was oppressed by the plundering incursions of the Amalekites and Midianites. The young Gideon nursed his patriotic and religious wrath in quietness until he saw that the people were ripe for resistance to the enemy. The Book of Judges gives us a dramatic glimpse of him 'threshing wheat by the wine-press to hide it from the Midianites.' Confident in the assurance of supernatural direction, he mustered the people, next reduced the unwieldy host to a handful of resolute men, fell suddenly upon the enemy in the neighbourhood of Mount Gilboa, and routed them with great slaughter. The effect of the victory was most decisive, and Israel enjoyed 'quietness forty years in the days of Gideon,' who was magnanimous enough to decline the proffered crown. Gideon's name occurs also in Heb. xi. 32, as that of a hero by faith, but nowhere else. In 1 Sam. xii. 11 he is called Jerubbaal, and Kuenen, refusing to accept the explanation offered (Judges, vi. 31–32), thinks this his original name; Gideon ('the hewer' or 'warrior') being an epithet attached afterwards. There are good grounds for believing the history of Gideon's conquest, given in Judges, to be but a dramatised and epitomised account of the course and issue of a struggle that extended over a long period; and that his rôle as a religious reformer, instead of being completed in early youth, was a continuous occupation throughout a long life.

Gien, a town in the French department of Loiret, on the Loire, 38 miles SE. of Orleans, has manufactures of pottery. Pop. 6833.

Giesebrecht, WILHELM VON, historian, was born on 5th March 1814 in Berlin, and became professor of History at Königsberg in 1857, and in 1862 at Munich. He died in December 1889. His chief works are *Geschichte der Deutschen Kaiserzeit* (5 vols. 1855–82), coming down to 1164; *Jahrbücher des Deutschen Reichs* (1840); a translation of Gregory of Tours (1851); *Deutsche Reden* (1871); *Arnold von Brescia* (1873).

Gieseler, JOHANN KARL LUDWIG, a great German writer of church history, was born 3d March 1793, at Petershagen, near Minden. He made his studies at Halle, and in 1813 volunteered as a soldier during the war of liberation. After the peace he returned to teaching, became *conrector* of the gymnasium at Minden, next director of the new gymnasium at Cleves. His *Entstehung und frühere Schicksale d. schriftlichen Evangelien* (1818) demolished the prevalent theory of a *primitive* written gospel, and procured him the chair of Theology at the new university of Bonn. Hence he was called to Göttingen in 1831, where he became in 1837 a consistorial councillor, and died 8th July 1854. His great work is the *Lehrbuch der Kirchengeschichte* (5 vols. 1824–57), of which the last two volumes were edited by Redepenning, who added also a sixth, the *Dogmengeschichte*, and prefixed a Life to the fifth volume. Gieseler's profound learning, judicial temper, and admirable faculty of throwing fresh light upon the original documents combine to make him an unusually satisfactory historian, and indeed he falls short of Neander only in his rarest gift—that profound spiritual sense to which he owed his insight. The English translation comes down only to the beginning of the Reformation; the American, to the peace of Westphalia.

Giessen, a town of Hesse-Darmstadt, is pleasantly situated at the confluence of the Wieseck and the Lahn, 40 miles N. of Frankfort-on-the-Main by rail. It is chiefly deserving of notice for its university (founded in 1607), which possesses well-appointed laboratories, collections, and museums, and a good library, with upwards of 50 professors, &c., and 500 students. Pop. (1875) 13,980; (1885) 19,001; (1895) 22,702. See three works by Buchner (1879–86).

Giffen, SIR ROBERT, K.C.B. (1895) and LL.D., statistician and writer on trade and finance, was born at Strathaven in Lanarkshire in 1837, studied at Glasgow University, and was trained in a solicitor's office. He entered journalistic life at Stirling in 1860, and two years later removed to London, where, a strong free-trader, he was connected with the *Globe* (until 1866), the *Fortnightly Review*, the *Examiner* (1868–76), and the *Daily News* (1873–76). In 1876 he was appointed chief of the statistical department of the Board of Trade, and in 1893 of the labour department also, but resigned in 1897. He was president of the Statistical Society from 1882 to 1884, and has published *Stock Exchange Securities* (1878), *Essays in Finance* (first series, 1879; 4th ed. 1886; second series, 1886), and numerous official reports and papers.

Gifford, ADAM, founder of the Scottish lectureships in natural theology, was born in Edinburgh in 1820, studied at the university there, and was called to the Scotch bar in 1849. He became sheriff of Orkney in 1865, was raised to the bench as Lord Gifford in January 1870, and died at Granton, near Edinburgh, 20th January 1887. By his will he left £25,000 to the university of Edinburgh, £20,000 each to Glasgow and Aberdeen, and £15,000 to St Andrews, to endow lectureships in natural theology, subject to no dogmatic tests whatsoever. The first lecturers appointed were Max Müller, E. B. Tylor, Andrew Lang, and J. Hutchison Stirling.

Gifford, WILLIAM, man of letters, was born at Ashburton, Devonshire, in April 1756. Left an orphan at twelve, he was first a cabin-boy, then for four years a shoemaker's apprentice, till in 1776 his attempts at versifying attracted the notice of a local surgeon. With his assistance he proceeded two years later as a Bible clerk to Exeter College,

Oxford, and, after graduating in 1792, travelled on the Continent with Lord Grosvenor's son. His first production, the *Baviad* (1794), was a satire on the Della Cruscans (q.v.); in Scott's phrase, it 'squashed them at one blow.' The *Maviad* (1795) was levelled against the corrupters of the drama, and *An Epistle to Peter Pindar* against Dr Wolcot, who retorted with *A Cat at a Cobbler*. Gifford's editorship of the *Anti-Jacobin* (1797–98) procuring him favour with the Tory magnates, he was appointed to offices that jointly brought him £900 a year. In 1802 appeared his translation of Juvenal, and prefixed thereto an autobiography. He edited the works of Massinger, Ford, Shirley, and Ben Jonson, and in his notes assailed former editors with brutal ferocity. In 1809 he became the first editor of the *Quarterly Review*, and this post he filled to within two years of his death, on 31st December 1826. Gifford possessed much satirical acerbity and poison, but as a poet he holds no rank whatever. As translator and editor of the old English dramatists he did good service; but his labours in this field were marred by suspicion and malignity. As a critic he was bitterly partial and one-sided; and his onslaughts on Hazlitt, Leigh Hunt, Lamb, Wordsworth, Shelley, and Keats have as little pretension to fairness and candour as has Hazlitt's own onslaught on him in the *Spirit of the Age* (1825).

Gift, in English law, means a gratuitous transfer of property. Any person is at liberty to do what he pleases with his own property, and to give it away with or without consideration, if he is so inclined. When he gives away goods or chattels, mere delivery of possession, accompanied by words of gift, is sufficient to transfer the property; and then the transaction is irrevocable. But if he does not give possession of the goods at the same time, then, that the gift may be binding upon him, he must execute a deed or writing under seal. The reason of this is that a mere verbal promise, without some legal consideration, is nugatory and revocable; whereas, when a person executes a deed, he is estopped from ever afterwards denying it. Where the property given is not personal, but real, then a deed is in general absolutely necessary to transfer the property. A will is the most familiar example of a gift of property both real and personal, for the testator generally, in such a case, gives away his property gratuitously. A gift of personalty by will is called a legacy or bequest, and a gift of land is called a devise.

As sometimes the power of giving away property gratuitously is abused in order to defraud and defeat creditors, it is provided by statute that a voluntary conveyance, whether of chattels or land, made by a person who is at the time insolvent, shall be void as against such creditors; and they are entitled, accordingly, to recover the property from the donee (13 Eliz. chap. 5). The gift, however, even in such a case, stands good against the donor himself. So, if any person give by deed gratuitously any land, and then sell the same land, the gift will be void against the *bonâ-fide* purchaser (27 Eliz. chap. 4).

There is a peculiar kind of gift, or rather a gift made in peculiar circumstances, called a *donatio mortis causa*—i.e. a gift of personal property made in immediate expectation of death, which is not meant to take effect unless the donor actually dies, and the donee survives him. Such gifts may be made by word of mouth; and they may be proved by the evidence of the donee himself—a rule quite inconsistent with the policy of the law, which requires a will to be duly executed and attested by disinterested witnesses.

In Scotland a gift may be made of goods in the same manner as in England; but it is usually called a donation. Gratuitous alienations by persons in insolvent circumstances are also held to be void as against creditors (stat. 1621, chap. 18). Though it is competent in Scotland to make a gift of goods or money by merely delivering the possession thereof, accompanied by words of gift to the donee, still there is this peculiarity, that if the transaction is afterwards impeached it can only be proved in Scotland by the donor's writ or oath, no matter how many witnesses may have been present; whereas, in England, it can be proved by ordinary witnesses, like any other fact.

Gift, in the law of Scotland, is also often used to denote a grant or appointment by the crown or a court, such as gifts of non-entry, escheat, tutory, &c.

Giga, or GIGUE, the name of a short piece of music, much in vogue in olden times; of a joyful and lively character, and in $\frac{6}{8}$ or $\frac{12}{8}$ time, sometimes in $\frac{3}{8}$; used formerly as a dance-tune, and often introduced as a movement of a larger composition. *Jig* is a form of the same word: the Irish jig is a dance-tune in $\frac{6}{8}$ time.

Gijon, a seaport of Spain, stands on a peninsula and bay of the Atlantic, 20 miles by rail NE. of Oviedo. It manufactures tobacco, glass, and earthenware; exports butter, cheese, and fruits, and to Great Britain hazel-nuts and copper ore; and imports grain, flour, sugar, oil, iron, machinery, spirits, chemicals, and woven goods. Exports, about £100,000 a year; imports £360,000. Here Jovellanos, a native of Gijon, founded the collegiate Asturian Institute. Pop. 35,170.

Gila, a river of North America, rising in the state of New Mexico, and flowing nearly 650 miles westward, across Arizona, till it joins the Colorado, about 75 miles above the fall of that river into the Gulf of California.

Gila Monster is a name commonly given to the poisonous lizard *Heloderma suspectum*, also called Sonoran Heloderm. It is one of the largest lizards of North America, and is found in the sandy

Gila Monster (*Heloderma suspectum*).

deserts of New Mexico, Arizona, and Texas. Its scales are brilliant orange and jet black. Its poisonous qualities it shares with its congener the *Heloderma horridum* of Mexico, which, like snakes, has grooved teeth and highly developed salivary glands at their bases. Its bite is rapidly fatal to small mammals and birds, and very injurious, though seldom fatal, to man. The heloderms are the only lizards ascertained to be venomous.

Gilbert, ANNE. See TAYLOR.

Gilbert, SIR HUMPHREY, English navigator, was born at Dartmouth, Devonshire, in 1539, and from Eton proceeded to Oxford. Then, abandoning

law for a career of arms, he did such good service against the Irish rebels as earned him knighthood and the government of Munster (1570), after which he saw five years' campaigning in the Netherlands. In 1576 appeared his *Discourse on a North-west Passage to India*, which was published by George Gascoigne, without his knowledge; two years later he obtained a royal patent 'to discover and occupy remote heathen lands not actually possessed of any Christian prince or people.' With his younger half-brother, Sir Walter Raleigh, he sailed in quest of the 'Unknown Goal;' but this expedition (1578–79), which had cost all his own and his wife's estates, was frustrated by internal dissensions, tempests, and a smart brush with the Spaniards. Nothing daunted, he once more set sail from Plymouth in June 1583, and in August landed in Newfoundland, of which he took formal possession for Queen Elizabeth. But, sailing southwards, he lost off Cape Breton the largest of the three vessels left out of five, so was forced to steer homewards with the *Golden Hind* and the *Squirrel*, the latter a 'frigate' of only ten tons burden. 'On Monday the 9th September,' writes the *Golden Hind's* captain, 'the *Squirrel* was near cast away, yet at that time recovered; and giving forth signs of joy, the general, sitting abaft with a book in his hand, cried out unto us in the *Hind*, "We are as near to heaven by sea as by land." The same Monday night the frigate's lights went suddenly out, and it was devoured and swallowed up by the sea.' So died Sir Humphrey Gilbert. See Hakluyt's *Collection*, vol. iii., and Lives of Raleigh by Tytler, St John, and Edwards.

Gilbert, Sir John, English painter, was born in 1817 at Blackheath, near London. School-days over, he was placed at a mercantile house in the City, but after two weary years was pronounced to be wholly unfit for business, and allowed to follow his true vocation—art. Save for some lessons from Lance, the fruit-painter, he taught himself; his masters, the old masters—Rubens, Rembrandt, Velasquez. In 1836 he began to exhibit both in oil and water-colours; and in 1852 he was elected an associate, in 1853 a member, in 1871 the president of the Society of Painters in Water-colours, receiving soon after the honour of knighthood. He also became an A.R.A. in 1872, an R.A. in 1876, and a Chevalier of the Legion of Honour. 'The Scott of painting' liked historical, chivalric, antiquarian subjects; and his style is familiar through countless wood-engravings in the *Illustrated London News*, and in editions of Shakespeare, Scott's Poems, *Don Quixote*, &c. His oil-paintings include 'Don Quixote,' 'Gil Blas,' 'Murder of Becket,' 'Joan of Arc,' 'Crusaders,' 'Wolsey at Leicester,' and 'Morning of Agincourt.' He died 5th October 1897, leaving £250,000. He had in 1893 made over to the nation his fine collection of paintings, to be distributed amongst London and other corporations.

Gilbert, William, author of a celebrated treatise on magnetism, was born in 1540 at Colchester. A member, and subsequently fellow of St John's College, Cambridge, he graduated in 1560, and in 1573 settled in London to practise as a physician. Eventually Elizabeth made him her court physician, and the same office was confirmed to him by James I. on his accession to the throne of England. After holding various offices in the College of Physicians, he was finally elected its president in 1600. He died a bachelor, 30th November 1603, either at Colchester or at London; he was buried at Colchester in the church of the Holy Trinity. His leisure time was largely given to the study of magnetism and chemistry. In the former subject he carried on some notable researches, principally contained in *De Magnete, Magneticisque Corporibus, et Magno Magnete Tellure* (1600), and the posthumously published *De Mundo nostro Sublunari Philosophia Nova* (1651). In the former he established the magnetic nature of the earth, which he regarded as one great magnet; and he conjectured that terrestrial magnetism and electricity were two allied emanations of a single force—a view which was only demonstrated with scientific strictness more than two centuries afterwards by Oersted and Faraday. Gilbert was the first to use the terms 'electricity,' 'electric force,' and 'electric attraction,' and to point out that amber is not the only substance which when rubbed attracts light objects, but that the same faculty belongs to the resins, sealing-wax, sulphur, glass, &c.; and he describes how to measure the excited electricity by means of an iron needle moving freely on a point. He also invented two instruments for finding latitude with the help of astronomical observations. See memoir prefixed to P. F. Mottelay's translation of *De Magnete* (1893).

Gilbert, William Schwenck, dramatist, was born in London, 18th November 1836, the son of William Gilbert (1804–89), who published thirty novels, tales, &c. He took the degree of B.A. at London university, was a clerk in the Privy-council Office from 1857 to 1862, and in 1864 was called to the bar. He contributed to the magazines, and was on the staff of *Fun*, in whose columns his *Bab Ballads* first appeared. His burlesque, *Dulcamara* (1866), was followed by other burlesques, dramas, comedies, fairy comedies, and operas. The fairy comedies include *The Palace of Truth* (1870), *Pygmalion and Galatea* (1871), *The Wicked World* (1873), and *Broken Hearts* (1876). Among the comedies are the charming 'contrast,' *Sweethearts* (1874), and *Engaged* (1877), more cynical and hopeless; his other plays include *Charity* (1874), *Gretchen* (1879), *Comedy and Tragedy* (1884), and an unsuccessful drama, *Brantinghame Hall* (1888). In conjunction with Sullivan (q.v.), besides *Thespis* and *Trial by Jury*, he has produced *The Sorcerer* (1877), *H.M.S. Pinafore* (1878), *The Pirates of Penzance* (1880), *Patience* (1881), *Iolanthe* (1882), *Princess Ida* (1883), *The Mikado* (1885), *Ruddigore* (1887), *The Yeomen of the Guard* (1888), *The Gondoliers* (1889), *Utopia Limited* (1893), and *The Grand Duke* (1896). In nearly all his better-known works Gilbert displays fantastic humour that is often subtle, nearly always healthy in tone, and none the worse for a slight flavour of cynicism. His is the hand of a master, though his touch is light; his quaint conceits, and the absurd earnestness with which they are worked out, appear to be inimitable by his contemporaries. In *The Yeomen of the Guard*, however, he has left the grotesque vein, and presents some characters that are human and pathetic. The operas have been exceedingly popular in America. For a time Gilbert and Sullivan worked apart; and with Dr Carr Gilbert produced *His Excellency* (1894). See P. Fitzgerald, *The Savoy Opera and the Savoyards* (1894).

Gilbertines, a religious order in the Roman Catholic Church, one of the few of English foundation. Its founder in 1148 was St Gilbert, a native of Sempringham, in Lincolnshire. The rule of the order was mainly derived from that of the Canons Regular of St Augustine. St Gilbert also founded an order of nuns after the Benedictine institute. Both orders were approved, and had numerous convents in England at the time of the Reformation, when they shared in the general suppression.

Gilbert Islands, an archipelago in the Pacific, lying on the equator between 172° and 177° E. long. Area, 166 sq. m.; population about 36,800. The group consists of sixteen atolls, several of them triangular in shape, with two out-

lying hilly islands. Some of the atolls (e.g. Penrhyn or Tumeiri) are rising in elevation. Cocoa-nuts and copra are the chief, almost the only, productions of the group. The inhabitants, a mixed Malayo-Polynesian race, closely resemble the Marshall islanders, though they speak a different language. Many of the people take service in Samoa, Fiji, &c. as labourers. The archipelago belongs to the jurisdiction of the British High Commissioner of the Western Pacific. It was discovered by Marshall and Gilbert in 1788.

Gil Blas. See LE SAGE.

Gilboa, a bare chain of hills between 500 and 600 feet high, overhanging the site of the ancient city of Jezreel, and rising between the fertile plain of Esdraelon on the west and the green valley of the Jordan on the east. It is memorable as the scene of the defeat and death of King Saul and his three sons at the hands of the Philistines.

Gilchrist, ALEXANDER, Blake's biographer, was born at Newington Green, 1828, the son of a Unitarian minister who, conscientiously withdrawing from the office of the ministry, removed, when Alexander was a year old, to a mill near Reading. At the age of twelve Gilchrist entered University College, London, where for four years he was a diligent scholar, and formed a friendship with the Rossettis. Leaving school at sixteen, he entered the Middle Temple in 1846, and was called to the bar in 1849, but never practised. Maintaining himself chiefly by art-criticism, he married in 1851. After collecting in Yorkshire materials for a Life of Etty, he settled in 1853 at Guildford. The *Life of Etty*, warmly commended by Carlyle, appeared in 1855. The following year he removed to Chelsea, taking a house next door to the Carlyles. Here was composed his *Life of Blake*, a labour of love engaging all his faculties. Before the task was yet completed, the author, in the full vigour of life, was cut off by scarlet fever on 30th November 1861. His wife, ANNE GILCHRIST, *née* Burrows, was born in London, 1828. In 1851 she married; in 1855 began to write for *All the Year Round*, in 1861 for *Macmillan's*. On her husband's death she undertook the completion of his *Life of Blake* (1863), to the second edition of which (1880) is appended a memoir of Alexander Gilchrist. In 1869 she published in the American *Radical Review* 'A Woman's Estimate of Walt Whitman;' and it was largely to become personally acquainted with the poet that she spent three years in America (1876–79), when she wrote for *Blackwood's* 'Glimpses of a New England Village.' In 1883 appeared her *Life of Mary Lamb*, and in 1885, only a few months before her death that year, her last essay, 'A Confession of Faith.' See *Anne Gilchrist: her Life and Writings*, by her son (1887).

Gild. See GUILDS.

Gildas, surnamed by some Sapiens, by others Badonicus, the earliest native British historian, flourished in the 6th century, and wrote in Armorica (about 550–560) his famous treatise *De Excidio Britanniæ Liber Querulus*. This was first printed at London in 1525, again in Gale's *Scriptores XV.* (1691), where it was first divided into two works, the History and the Epistle. The treatise falls naturally into two distinct portions: from the invasion of Britain by the Romans to the revolt of Maximin at the beginning of the 4th century, and from the close of the 4th century to the writer's own time. It is Gildas who narrates the story of the famous letter sent to Rome in 446 by the despairing Britons, commencing: 'To Ægidius (Ætius) consul for the third time, the groans of the Britons.' Gildas is a weak and wordy writer, and the value of his historical work has been assailed by Sir T. D. Hardy and others, but is vigorously defended by Dr Guest; and it must be remembered that its latter portion was adopted without hesitation by Bede. Gibbon has described him in a single sentence as 'a monk, who, in the profound ignorance of human life, has presumed to exercise the office of historian, strangely disfigures the state of Britain at the time of its separation from the Roman empire.' An edition of Gildas, edited by Joseph Stevenson, was published by the Historical Society in 1838; a new translation by J. A. Giles in 1841.

Gilding. There are many processes of gilding, varying with the nature of the substance to be gilded, and the kind of effect required to be produced, but they may all be classified under three heads—viz. (1) mechanical gilding, (2) chemical gilding, (3) encaustic gilding.

The first is used chiefly for gilding wood, plaster of Paris, leather, paper, and other substances. If the object to be gilt is a picture or mirror frame, consisting of a plain wooden moulding, then, after getting a coat of oil-paint, from four to ten coats of fine whiting mixed with fine glue are put on, each in its turn being smoothed with pumice-stone and fine sand-paper. This done, a coat of gold-size is given to those parts which are not to be burnished; but those which are receive only a coating of clear animal size. Both of these prepared surfaces now receive the gold-leaf, which is laid on by means of a broad thin brush called a *tip*, and further pressed on with a thick soft-haired brush. Those parts which have been gold-sized are in this way oil-gilt, and will stand washing; while such portions as have been gilt on the size preparation in order to be burnished will not bear soap and water. If the picture-frame is much enriched with fine raised ornament, the surface to be gilt is previously prepared with oil-paint and gold-size alone, as the coating with whiting destroys the sharpness of the work. The result, however, is more tender and less durable.

Japanner's Gilding.—Where gilt ornaments are to be put on a japanned ground, they are, by one method, painted with gold-size, and gold-leaf afterwards applied. By another method, rather more than the space the ornament is to occupy is wholly covered with gold-leaf, adhering with isinglass. The ornament is then painted on with asphaltum, which protects the gold beneath it while the superfluous leaf is being washed away. A little turpentine will then remove the protecting asphaltum so as to display the gilt ornament. Japanners' gold-size is a mixture of linseed-oil, gum-animi, and vermilion.

False Gilding, although an old invention, has become in recent years an important trade in Germany. The moulding intended to be 'gilt' in this way is first covered with bright silver-leaf or tinfoil on a surface prepared as above, and then coated with a yellow varnish. Other substitutes for genuine gilding that are largely used consist in applying 'Dutch gold,' which is copper beaten out like gold-leaf, as in genuine gilding, or in using so-called 'gold paint,' which is finely powdered brass or other similar alloy.

Chemical Gilding.—Metals are now usually gilded by the process of electro-gilding (see ELECTRO-METALLURGY); but, besides this, various methods of chemical gilding have been adopted, and some are still in use.

Water or Wash Gilding, as it is somewhat inappropriately termed, consists in applying to metal a paste formed of an amalgam of gold, and afterwards evaporating the volatile mercury by heat, which leaves the gold firmly adhering to the surface of the metal.

Gilding by Immersion.—For this purpose a

solution of gold in nitro-muriatic acid is used which slowly attacks the metal to be gilded, and at the same time deposits on its surface an equivalent of gold. The method called *Grecian Gilding* is another similar process, in which gold is used dissolved in a solution of sal-ammoniac and corrosive sublimate in nitric acid.

Most articles that are gilded by either of the above chemical methods, or by electro-gilding, are submitted to an after-process of *colouring*. This consists either in acting upon the surface with a saline solution, and heating the article afterwards, or in coating it with a kind of varnish of beeswax and yellow ochre, and then burning this off. The colouring of jewelry, &c., made of gold alloyed with copper or brass, is performed by submitting the article to the action of a mixture of nitre, alum, and common salt, either dry or dissolved in water, heat being applied in either case. The baser alloy is thus removed from the surface, which becomes covered with a richly coloured film of nearly pure gold.

Sword-blades, lancets, and other steel articles are gilded in fancy devices by drawing the design with a camel-hair pencil moistened in a solution of gold, prepared by agitating ether with a solution of terchloride of gold, and decanting the light liquid which floats on the top.

Silks, artificial flowers, ivory, bone, &c. may be gilded by immersing them in, or painting them with, a neutral solution of one part of terchloride of gold to four or five of water, and then exposing them in a vessel containing hydrogen gas, which readily combines with the chlorine, and reduces the gold to the metallic state.

Encaustic Gilding is usually applied to glass and porcelain. The gold is first obtained in a finely divided state by precipitating from the chloride with protosulphate of iron, or by simply heating the chloride. This powder is ground up with $\frac{1}{12}$th of its weight of oxide of bismuth and some borax and gum water, and then painted on the ware. It is then heated till the borax is vitrified and the gold thereby fixed. Sometimes the gold is ground with turpentine, or an amalgam of gold is used. This has a brown dingy appearance when it leaves the kiln; the gold lustre is brought up by burnishing.

Gilding Metal.—The metal of which gilded goods are made is required to have as nearly as possible the colour of gold, so that when the surface-gilding is worn off at the more exposed parts the difference of colour will not be readily apparent. This is obtained by making a kind of brass having a much larger proportion of copper than common brass. The following are three receipts from among a variety in use: (1) 6 parts copper, 1 common brass; (2) 4 parts copper to 1 Bristol brass; (3) 13 parts copper, 3 parts brass, 12 parts tin. The last is much harder than No. 1 or 2.

Gilead (in Eng., 'region of rocks') was a mountainous district on the east side of the Jordan, bounded on the N. by the Hieromax (Yarmuk), on the E. by the desert tablelands of Arabia, on the S. by Moab and Ammon, and on the W. by the Jordan. The highest ridges of Gilead are of dark-gray limestone; lower down are yellow and purple sandstones. Though all is desolate above, on the slopes the vegetation is luxuriant, and forests of oak and terebinth occur. The name is not borne out in the character of the country, and the glens exhibit great beauty and profusion of vegetation. The district was given to the tribes of Manasseh, Gad, and Reuben, because of the multitude of their cattle, and as a frontier land was much exposed to invasion. There is mention of Gilead in Gen. xxxi. Ramoth (Es-Salt), Jabesh, and Jazer are three of the cities mentioned in Scripture. Laurence Oliphant (q.v.), who speaks of Gilead as a country of wine and oil, with rich alluvial deposits, submitted a scheme to the government at Constantinople for its colonisation by Jews. The Dead Sea region he regarded as a mine of unexplored wealth, from which chlorate of potassium, petroleum, and bitumen might be exported. The local conditions he believed favourable to the introduction of immigrants. See Oliphant's *Land of Gilead* (1880).

Giles, ST (Lat. *Ægidius*), was an Athenian of royal descent, devoted from his cradle to good works. After giving away his entire patrimony, he lived two years with St Cæsarius at Arles in Provence, and then retired alone to a neighbouring desert, where he sustained nature upon herbs and the milk of a hind that came of herself to his cave. Once, on a hunting expedition, the king of France, following up the track of the hind, discovered Ægidius, and compelled him to become the first abbot of a monastery he built upon the spot. Here he died. His festival falls upon 1st September. In the 6th century there was an abbot in Provence named Ægidius, but the date of the saint is usually given as about the close of the 7th century. He early became regarded as especially the patron of lepers, beggars, and cripples, and his cult spread quickly over England, France, and Germany. In London, the church of St Giles, Cripplegate, and the leper hospital at St Giles-in-the-Fields, and in Edinburgh the High Kirk of St Giles still commemorate his name. See Rembry, *St Gilles, sa Vie, ses Reliques, son Culte* (Bruges, 1884).

Gilfillan, GEORGE, critic and essayist, was born in 1813 at Comrie, Perthshire, where his father was Secession minister. He studied at the university of Glasgow, and at the divinity hall of the Secession body, afterwards the United Presbyterian Church, and in 1835 he was licensed to preach the gospel. In 1836 he was ordained to the School Wynd Church, Dundee, where he remained till his death, 13th August 1878. He attained considerable reputation as a lecturer and pulpit orator, and was incessantly industrious with his pen. His friends and fellow-citizens presented him with £1000 in 1877. His works are numerous. They display a rich but reckless fancy, and wide literary sympathies, although deficient perhaps in refinement of taste. Among them are *A Gallery of Literary Portraits* (3 vols. 1845-54); *The Bards of the Bible* (1850; 7th ed. 1887); *The Martyrs of the Scottish Covenant* (1852); *History of a Man*, largely autobiographical (1856); *Alpha and Omega* (1860); *Night: a Poem* (1867); *Remoter Stars in the Church Sky* (1867); Lives of Scott (1870), Dr W. Anderson (1873), and Burns (1880); and *Sketches, Literary and Theological* (1881). In 1853 he commenced an edition of the *British Poets* in 48 vols. His *Letters and Journals, with Memoir* by Watson, appeared in 1892.

Gilghit. See CASHMERE, DARDISTAN.

Gill, a measure of capacity, is the fourth part of a pint, or the thirty-second part of a Gallon (q.v.).

Gill, JOHN, an eminent Baptist divine, was born at Kettering, Northamptonshire, November 23, 1697. He was mainly self-educated, yet became proficient in Latin, Greek, and Hebrew, and afterwards devoted himself much to the study of the rabbinical writers. He became in 1719 pastor of a Baptist church in Southwark; from which, in 1757, he removed to a chapel near London Bridge, where he ministered till his death, October 14, 1771. His first important work was an *Exposition of the Song of Solomon* (fol. 1728), in which he vindicated the authenticity of that book against Whiston. His *Exposition of the New Testament* appeared in 1746–

48; and subsequently his *Exposition of the Old Testament* republished as one work, 9 vols., with a memoir, in 1810; *A Body of Doctrinal Divinity* (1769); and *A Body of Practical Divinity* (1770). He wrote also, as a controversialist, in defence of the doctrine of the Trinity and of Calvinism. Gill received the degree of D.D. from Aberdeen in 1748. He was a robust Calvinist, devout, laborious, and learned.

Gillenia, a North American perennial genus of Rosaceæ, closely allied to Spiræa, and similarly suitable for shrubberies. The roots are often called Indian Physic, sometimes *Wild Ipecac*, *Indian Hippo*, *Dropwort*, and *Bowman's Root*.

Gillespie, George, a prominent figure among the Westminster Divines, was born at Kirkcaldy, where his father was parish minister, 21st January 1613. He pursued his studies at St Andrews, and early in 1638, after the power of the bishops had been pulled down, was ordained minister of Wemyss in Fife. He showed characteristic fearlessness at the Glasgow Assembly that same year, was translated to Edinburgh in 1642, and the year after was sent up, as one of Scotland's four representatives, to the Westminster Assembly, where his vigour, ability, and earnestness enabled him to take a great part in the protracted debates on church discipline and dogma. His *Aaron's Rod Blossoming, or the Divine Ordinance of Church-government Vindicated* (1646), is admittedly a masterly statement of the high Presbyterian claim for full spiritual independence. In 1648 Gillespie was appointed moderator of the General Assembly, but his already enfeebled frame soon sank under its labours. He died at Kirkcaldy, 17th December 1648.

Gillies, John, historian, was born at Brechin, in Forfarshire, January 18, 1747. He was educated at the university of Glasgow, and for several years acted as tutor to the sons of the Earl of Hopetoun. In 1778 he published a translation of the *Orations of Isocrates and Lysias, with some Account of their Lives;* and in 1786 his principal work, the *History of Ancient Greece*, 2 vols. It was extremely popular on its first appearance, but has dropped out of notice since the publication of the histories of Thirlwall and Grote. His *View of the Reign of Frederick II. of Prussia* appeared in 1789. In 1793 he was appointed historiographer to the king for Scotland. He also published a translation of *Aristotle's Ethics and Politics* (1797), and of *Aristotle's Rhetoric* (1823), and a *History of the World from Alexander to Augustus* (2 vols. 1807–10). He died at Clapham, February 15, 1836.

Gillingham, a market-town of Dorsetshire, on the Stour, 22 miles by rail W. of Salisbury. Near it are the 'Pen Pits,' thought variously to be quarry-holes or prehistoric dwellings. Pop. of parish, 4131.

Gillis Land, Polar land NE. of Spitzbergen, first sighted in 1707 by Gillis, a Dutchman, in 81° 30 N. lat. and 36° E. long., but not visited by him. Some geographers identify it with King Charles or Wiche Land, one of the Spitzbergen group, situated in 79° N. lat., and between 26° 30′ and 32° 30′ E. long.

Gillott, Joseph, born at Sheffield on 11th October 1799, shares with Sir Josiah Mason the credit of having brought the manufacture of steel-pens to its present state of high perfection (see Pens). He died 5th January 1873.

Gillray, James, an English caricaturist, born at Chelsea, of humble parentage, in 1757. He first became known as a successful engraver about 1784, and between 1779 and 1811 issued as many as 1500 caricatures, numbers of which, it is said, 'were etched at once upon the copper without the assistance of drawings.' They are full of broad humour and keen satire, the subjects of his ridicule being generally the French, Napoleon, George III., and the principal English politicians; he also employed his talents in castigating the social follies of his day. He died in London, 1st June 1815. Gillray lived for many years in the house of the printseller, Miss Humphrey, in London. During the last four years of his life he was insane. His caricatures, which were very popular and not without influence upon public opinion, often rise to a lofty level of conception, and display true artistic feeling. A selection of them was published by M'Lean (accompanied by an illustrative description), in 304 sheets (Lond. 1830). An edition with Life and Times of Gillray, by T. Wright, was issued by Bohn (1851; new ed. 1873).

Gills, or Branchiæ, organs of aquatic respiration, consisting of expansions through the thin skin of which oxygen dissolved in the water is taken into the blood, while carbonic acid passes out. It is difficult to say what animal first exhibits gills; for respiration through the general skin is common in lower Invertebrates, and the distinction between mere skin lobes and marked expansions in special connection with the vascular system is arbitrary. In starfishes thin out-pushings of the lining of the body-cavity project through pores in the skin; a modification of this simple plan is seen in some other Echinodermata; while the characteristic tube-feet are sometimes respiratory, and the Holothurians have often respiratory tentacles. In marine worms we find every transition from vague skin respiration to the increase of this by filaments or tentacles associated with legs or head,

Fig. 1.—Section of an Annelid Worm: *br*, gills; *a*, *b*, blood-vessels; *i*, intestine. (From Gegenbaur.)

and finally to definite gills. These are usually thin expansions, filamentous, tufted, or feathery, which project into the water, have cilia on their outer surface, and blood-vessels riddling them internally. In some of the lower Crustaceans again (Branchiopoda—i.e. 'gill-footed') a number of the legs are thin enough to admit of respiration through their surfaces, while the higher forms have associated with some of their limbs special tufts of respiratory filaments, or definite feathery gills, as in the lobster. These consist of a main stem, within

Fig. 2.—Gills of Crayfish exposed (after Huxley).

which are two canals, one for the impure blood from the body, the other for the return of oxygenated blood on its way to the heart; but with these canals are connected numerous hollow, thin-

walled filaments, in which the real respiration is effected. In the lobster and its allies these are overlapped by the sides of the anterior shield, but water currents are kept up by the baling action of one of the anterior appendages on each side. In the King-crab (Limulus), rather an Arachnid than a Crustacean, five pairs of abdominal appendages bear flat 'gill-books,' each of which consists of an axis bearing some 150 hollow, thin-walled, blood-containing leaves. In the aquatic larvæ of some insects the air-tubes (tracheæ) are closed, but form gill-like outgrowths ('tracheal gills'), by means of which oxygen is absorbed. In bivalve molluscs (Lamellibranchs) the gills usually form ciliated plates on each side of the body. Each gill, or ctenidium, as it is often called, really consists of two rows of hollow processes of the body-wall, extending downwards on each side of the foot, but each filament at its free end usually bends up again, so that a cross section has the form of a W, the median apex of which represents the point of origin from the body-wall. Neighbouring filaments become linked to one another, and ascending and descending parts of the same filament are likewise crossed by bridges, so that finally continuous plates result, channelled by blood-containing canals. Somewhat simpler on the whole are the external gill filaments of chiton, of the limpet, of nudibranchs, &c., or the internal gills (covered by a folding of the mantle) in many aquatic Gasteropods; or lastly, the well-developed feather-like gills in the mantle cavity of cuttle-fishes.

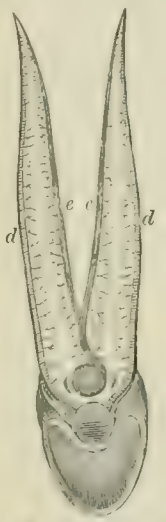


Fig. 3. — Diagram of the Circulation of the Blood through the Gills:
d d, artery and branches; *c, c*, vein and branches.

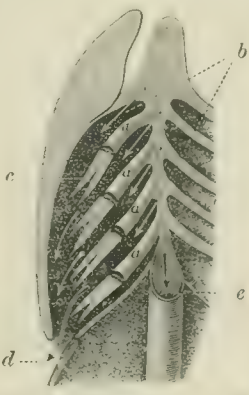


Fig. 4. — Dissection of the Pharynx of a Fish:
Showing by arrows, *b*, the course of the water; *a*, the gill arches; *c*, the gills; *d*, the external opening; *e*, the gullet.

Among vertebrates gills are developed only as far as the amphibians, all of which have them in their youth, though many, such as the frog, have them entirely replaced by lungs in adult life. Beyond amphibians gills never occur, though branchial or visceral clefts on the sides of the pharynx remain as traces of the ancestral condition. In tunicates and in the lancelet water entering by the mouth washes the blood spread out in vessels between slits on the walls of the pharynx, but there are no gills. In the round mouths, or Cyclostomata, the gills are enclosed in pocket-like structures, through which the water passes. In fishes we have to distinguish transitory external gills occasionally present from true internal gill-filaments borne on the branchial arches, and washed as usual by the water which entering by the mouth passes out by the gill-slits. The gill of a fish generally consists of two triangular folds of mucous membrane, supported by the branchial arch and minor cartilaginous rods, and traversed,

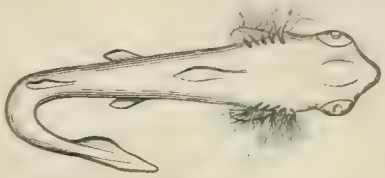


Fig. 5.
Young Dog-fish, showing transitory external gills.

as the diagram suggests, by vessels with impure blood from the heart, and with oxygenated blood to the body (see FISHES). For Amphibia, see the case of the tadpole described in the article FROG, and the various adult states described in the article AMPHIBIA. The student should examine especially the gills of bivalves—e.g. mussel—of fishes, and of tadpoles. See CIRCULATION, MOLLUSCA, RESPIRATION.

For the general comparative anatomy of gills, see Professor F. Jeffrey Bell's *Comparative Anatomy and Physiology* (Lond. 1885), and other text-books. For minute structure of gills, see especially Holman Peck, *Quart. Journ. Micr. Sci.* xvii. (1877), and Professor Ray Lankester's article 'Mollusca' in the *Ency. Brit.*

Gillyflower, a popular English name for some of the cruciferous plants most prized for the beauty and fragrance of their flowers, as wallflower in the west of England, stocks in other parts, &c.; also for *Hesperis matronalis*, Dame's Violet (q.v.). The clove-pink also, the wild original of the carnation, is called *Clove-Gillyflower*. The name gillyflower has been regarded as a corruption of *July-flower;* but in Chaucer it appears in the form *gilofre;* and the French *giroflée* indicates the true derivation from *girofle*, a clove, the smell of the clove-gillyflower being somewhat like that of cloves.

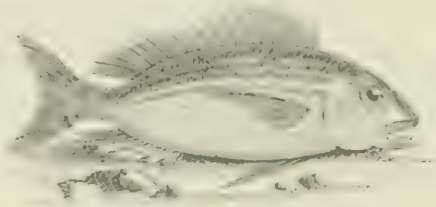
Gilolo, one of the Moluccas (q.v.) or Spice Islands.

Gilpin, BERNARD, the 'Apostle of the North,' was born of an old Westmorland family, at Kentmere Hall, in 1517, studied at Queen's College, Oxford, and early showed unusual aptitude for learning. In 1552 he became vicar of Norton, in the diocese of Durham, but soon resigned the living to pursue his studies at Louvain. Returning to England towards the close of Mary's reign, he was appointed by his uncle Bishop Tunstall to be archdeacon of Durham and rector of Easington. Here his fearless honesty against pluralities and the indolence and viciousness of the clergy soon made him many enemies, whose charges of heresy Tunstall not only set aside, but, after Gilpin had resigned both his living and the archdeaconry, appointed him to be rector of Houghton-le-Spring. On the way to London, whither he had been summoned by Bonner, he accidentally broke his leg, and before he was able to resume his journey Elizabeth had succeeded Mary and he was safe. The see of Carlisle and the provostship of Queen's College, Oxford, were in turn offered him, but both he refused, preferring to spend the remainder of his life at Houghton in unceasing works of benevolence. His parish was wide, and sunk in the deepest ignorance, but he continually preached and exhorted in the pulpit and from house to house, settled the quarrels of his turbulent parishioners, set up a grammar-school, and practised unbounded hospitality to strangers, to travellers, and to the poor, spending 'every fortnight 40 bushels of corn, 20

bushels of malt, and an ox, besides a proportional quantity of other kinds of provisions.' Through Cecil he had obtained the rare distinction of a general license for preaching, and armed with this he regularly made preaching excursions into the wilder parts of Cumberland, Westmorland, and Northumberland. His visits to the turbulent districts of Tynedale and Redesdale he generally made about Christmas time, when it was easiest to gather the people together. The fearlessness of his temper is seen in the story of his taking down and putting into his bosom a glove which had been hung up as a challenge in a church in which he had to preach. His own naturally warm temper he held under complete control. His tall and slender person, his indifference to dress, and temperance in diet, added to his rare spiritual elevation of character, helped to make this singular man's influence over his people supreme. His last years were troubled with infirm health, from which he was relieved by death, 4th March 1583. There is a life of Gilpin written by Bishop Carleton, one of his pupils, in Bates's *Vitæ Selectorum aliquot Virorum* (1681), a translation of which will be found in vol. iii. of C. Wordsworth's *Ecclesiastical Biography*. See also Collingwood's *Memoirs of Bernard Gilpin* (1884).

Gilpin, WILLIAM, was born at Carlisle in 1724. He was educated at Oxford, and kept a school at Cheam in Surrey, but was afterwards presented to the living of Boldre in Hampshire, where he died in 1804. His name is remembered for a series of books on the scenery of various parts of Britain illustrated by aquatint engravings of his own execution. Of these the chief are *Observations on Picturesque Beauty in several parts of Great Britain, particularly the Highlands of Scotland* (1778); *The River Wye and Southern Districts of Wales* (1782); *The Lake Country* (1789); *Forest Scenery* (1791); and *The Western Parts of England and Isle of Wight* (1798).

Gilthead (*Chrysophrys*), a genus of 'sea-breams' or Sparidæ, represented by about a score of species from the warmer seas, best known by the Mediterranean species (*Ch. aurata*), sometimes found on the southern coasts of England. Large species occur off the Cape of Good Hope, and *Ch. hasta* is common on East Indian and Chinese coasts. The gilthead has an oblong and compressed body, a single dorsal fin with spines which can be received into a groove, scaly cheeks and gill-cover, and two kinds of teeth, sharp like canines in front, rounded like molars behind. The length is about a foot; the back is silvery gray,



Common Gilthead (*Chrysophrys aurata*).

shaded with blue; the belly like polished steel; the sides have golden bands; and there is a half-moon-shaped spot of gold between the eyes to which the various names *Chrysophrys* ('golden eyebrow'), *Aurata* ('gilded'), Daurade, and Gilthead obviously refer. They feed chiefly on molluscs, in search of which they are said to stir up the sand with their tails. The fish is generally found near the shore in small shoals, and its presence is sometimes betrayed to fishermen by the noise which its teeth make in crushing shells. It was often kept in the *vivaria* by the Romans, being much valued and easily fattened.

Gil Vicente, the father of the Portuguese drama, was born, probably at Lisbon, about 1470, and died, probably at Evora, shortly after 1536. He studied jurisprudence at the university of Lisbon, but soon abandoned this for dramatic poetry. His first piece, a pastoral drama in Spanish, was represented in 1502, to celebrate the birth of an heir to the throne. The success of this play led to his being employed on all similar occasions throughout the reigns of Emanuel and John III. He produced in all 42 pieces, of which 10 were in Spanish, 17 in Portuguese, and the remainder in both languages. They consist of religious dramas, comedies, and farces; are composed almost wholly in the medieval spirit; and contain several touches of poetic feeling, and in places are rich in humour. The first edition of his works was published in 1562. In 1834 a complete reprint was issued by Feio and Monteiro (3 vols. Hamb.).

Gimbals (Lat. *gemellus*, 'a twin') are two circular brass hoops used for suspending the compass-box on board ship, so that it may always rest horizontally, unaffected by the ship's motion. The outer hoop is attached to a box or other fixed object, while the inner is constructed so as to allow of its moving freely within the outer, to which it is attached by two pivots at the extremities of a diameter. The compass-box is attached to the inner hoop by two similar pivots at right angles to the former. Thus the compass moves freely in two directions at right angles to each other, and can always retain its horizontal position, however the vessel may roll or pitch. Gimbals are also applied to other instruments.

Gimp, or GYMP, a kind of trimming for dress, curtains, furniture, &c., made either of silk, wool, or cotton. Its peculiarity is that fine wire is twisted into the thin cord of which it is made. Gold and silver are used in the manufacture of military gimps.

Gin, or GENEVA, an alcoholic drink, distilled from malt or from unmalted barley or other grain, and afterwards rectified and flavoured. The gin which forms the common spirituous drink of the lower classes of London and its vicinity is flavoured very slightly with oil of turpentine and common salt. Each rectifier has his own particular recipe for regulating the quantities to be used, but usually about 5 fluid ounces of spirit of turpentine and 3½ lb. of salt are mixed in 10 gallons of water; these are placed in the rectifying still, with 80 gallons of proof corn-spirit, and distilled until the feints begin to come over. The product is then used either unsweetened or sweetened with sugar. Potato spirit is used in the manufacture of inferior qualities of gin.

The word *gin* is a shortened form of *genera*, so called by confusion with the Swiss town of Geneva, but itself really a corrupted form of the Old Fr. *genevre*, 'juniper,' from the Lat. *juniperus*. It is well known that juniper-berries are still used in flavouring the spirit made from rye-meal and malt in Holland, where it is an article of great manufacture, chiefly at Schiedam; hence it is often called *Schiedam* or Hollands, as well as geneva and gin. The larger part by far of the spirit made in Holland is exported to other countries, especially to North America and northern Europe. It was formerly always exported in bottles, a square form of which is still familiar, but casks are now much used as well.

Almost every gin-palace keeper in London has some vile recipe for increasing the pungency and giving a factitious strength to the much-diluted sweetened spirit sold under this name. A mere

enumeration of the articles usually employed will give some idea of the extent to which sophistication is carried on with this spirit: roach alum, salt of tartar (carbonate of potash), oils of juniper, cassia, nutmeg, lemons, sweet fennel, and caraway, coriander seeds, cardamoms, and capsicums, and, it is alleged, even sulphuric acid. Excess of turpentine is the most common and perhaps the worst adulterant. Still much sound gin is made in London—the diuretic qualities of its 'Old Tom,' as well as of Hollands, are well known.

Ginckell (or GINKEL), GODERT DE, Dutch general, born at Utrecht in 1630, accompanied William III. to England in 1688. Along with his master he crossed over to Ireland in 1690, and commanded a body of horse at the battle of the Boyne. On the king's return, Ginckell was left as commander-in-chief in Ireland. He thereupon reduced Ballymore and Athlone, defeated St Ruth at Aghrim, and finally captured Limerick. For this he was in 1692 created Earl of Athlone. He afterwards commanded the Dutch troops under Marlborough in the Low Countries. He died at Utrecht, 11th February 1703.

Gingal, a large, clumsy musket used by Asiatic armies in the defence of fortresses, and sometimes mounted on carriages as a light field-gun.

Ginger (*Zingiber*), a genus of Zingiberaceæ, of which most species yield root-stocks useful as condiments and stomachics, especially the narrow-leaved or common ginger (*Z. officinale*), which has been cultivated in the East Indies from time immemorial, and is now also cultivated in other tropical countries, particularly the West Indies and Sierra Leone, from both of which, as well as from the East Indies, its root-stocks—the ginger of commerce—are a considerable article of export. The cultivation is extremely easy, and is carried on up to 4–5000 feet

Common Ginger (*Zingiber officinale*):
a, plant with barren and flowering stems; *b*, a flower; *c*, portion of leafy stem. (From Bentley and Trimen.)

in the Himalayas in moist situations. The root-stock is taken up when the stems have withered, and is prepared for the market either simply by scalding in boiling water—in order to kill it—and subsequent drying, or by scraping and washing. The first method yields *Black Ginger*, the second *White Ginger;* but there are considerable varietal differences in the shades of these. The blackest of Black Ginger, moreover, is only of a stone colour, and the whitest of White Ginger very far from perfectly white, unless bleaching by chloride of lime be afterwards employed to improve its appearance—a process not otherwise advantageous. The uses of ginger, both in medicine as a stimulant and carminative, and in domestic economy as a condiment, are too well known to require particular notice. It contains a good deal of starch, but its main qualities depend upon its pale yellow volatile oil. *Preserved Ginger*, largely imported from China and the East and West Indies, consists of the young root-stocks preserved in syrup: it is not only a delicious sweetmeat, but a useful stomachic. The young root-stocks are often also candied.—Ginger was known to the Romans, and is said by Pliny to have been brought from Arabia.—Zerumbet (*Z. zerumbet*), also called Broad-leaved Ginger (and sometimes erroneously Round Zedoary), is cultivated in Java; its root-stock is much thicker, but less pungent.—Cassumunar (*Z. cassumunar*), sometimes called Yellow Zedoary, has a camphor-like smell, and a bitter aromatic taste. It was of high reputation as a medicine about the close of the 17th century.—Mioga (*Z. mioga*) is less pungent than ginger, and is used in Japan.—Cattle sent to graze in the jungles of northern India, during the rainy season, are supplied with the root-stocks of *Z. capitatum*, to preserve their health.—The root of *Aristolochia* (q.v.) *canadense*, sometimes called *Indian Ginger* or *Wild Ginger* in North America, is applied to similar uses.

Essence of Ginger, much used for flavouring, is merely an alcoholic tincture.—*Syrup of Ginger* is used chiefly by druggists for flavouring.—*Ginger Tea* is a domestic remedy very useful in cases of flatulence, and is an infusion of ginger in boiling water.—*Ginger-beer* is an effervescing drink made by fermenting ginger, sugar, and some other ingredients, and bottling before the fermentation is completed.—*Ginger Wine* or *Ginger Cordial* is a liqueur flavoured with ginger.—*Ginger Ale* is one of the Aerated Waters (q.v.).—*Gingerbread* is a very well-known article of food, which in the 14th century was made of rye dough, kneaded with ginger and other spice, and honey or sugar. Now its constituents are treacle, moist sugar, wheaten-flour, butter, and eggs, flavoured with ginger and other spices; a little carbonate of magnesia and tartaric acid, or carbonate of ammonia, are sometimes put in to give lightness.

Gingham (Fr. *guingan;* according to Littré, a corruption of the name of the town of Guingamp), a cotton fabric manufactured chiefly for dresses. It is of a light or medium weight, and is woven from coloured yarns into stripes or checks; but the patterns, while preserving this general character, are endlessly varied both as to figure and colour. These being produced by weaving, the fabric differs from printed calico, some of the patterns on which resemble those of ginghams. Genuine Earlston ginghams still command a high price owing to their excellent quality, but they are now only made to a very limited extent, Glasgow and Manchester being the centres where this kind of goods is manufactured on a large scale. Cotton stuffs sold under other names, such as zephyrs and chambreys, partake of the nature of ginghams.

Gingili Oil, a name often given to the bland fixed oil obtained by expression from the seeds of *Sesamum Indicum*. See SESAME.

Gingko (*Gingko biloba*, or *Salisburia adiantifolia*) is the Japanese name of a coniferous tree of the yew alliance (Taxaceæ), with very characteristic leaves, in form and variation recalling the leaflets of the maiden-hair ferns. The yellow drupe-like seeds reach the size of a walnut, and are largely eaten throughout China and Japan; the chestnut-like kernels are roasted like chestnuts, and also

yield a wholesome oil. The Japanese esteemed the tree as sacred, and planted it round their temples. Being a free grower, and having been introduced in the 18th century, large trees are now not uncommon in Europe, nor in America, where they were introduced in 1784. The tree is dioecious, but the Chinese sometimes plant several male and female trees close together, so that male and female flowers appear to arise on the same tree.

Ginkell. See GINCKELL.

Ginseng, a root highly esteemed in China as a medicine, being universally regarded as possessing the most extraordinary virtues, and as a remedy for almost all diseases, but particularly for exhaustion of body or mind. It is the root of a species of Panax (order Araliaceae), appropriately so called since so typical a panacea. *P. Ginseng* of Chinese Tartary is, however, scarcely distinct from *P. quinquefolium* of North America, which is exported to China to the amount of about 500,000 lb. annually, but fetches a lower price. The ginseng of Corea is most valued, and is carefully cultivated in that country. It is raised from seed; the seedlings are planted out, and frequently transplanted, and it is not till the fifth year that the plant reaches maturity. Ordinary ginseng is prepared by simply drying the root over a charcoal fire; the red or clarified ginseng is steamed in earthenware vessels with holes. The root is mucilaginous, sweetish, also slightly bitter and aromatic. It has been regarded as a very elixir of life all over the East, but especially in China and Japan. Western medical practitioners, however, have as yet failed to confirm or explain its extraordinary reputation among the Chinese. The export from Corea, amounting to 27,000 lb. in a good year, is a strict monopoly. The wild ginseng of Corea has frequently fetched twenty times its weight in silver in China. *P. fruticosus* and *cochinchus* of the Moluccas are fragrant aromatics used in Indian native medicine.

Gioberti, VINCENZO, an Italian philosopher and political writer, was born 5th April 1801, at Turin. Educated for the church, he was ordained to the priesthood in 1825, and on the accession of Charles Albert to the throne of Sardinia was selected as chaplain to the court. But, his liberal views being obnoxious to the clerical party, he was two years later suddenly arrested, and after four months' imprisonment sent out of the country. After a short stay at Paris, the exile went on (1834) to Brussels, where he spent eleven years as private tutor in an academy, pursuing in his leisure hours his favourite studies. These were at first of a philosophic nature, the fruits of his labours appearing in *Introduzione allo Studio della Filosofia* (1839), *Del Bello* (1841), and *Del Buono* (1842). Towards the end of his period of exile in Brussels he began to write on the state of Italy. A devout Catholic, Gioberti looked upon the papacy as the divinely appointed agency for the elevation of Italy among the nations. A confederation of states subject to papal arbitration, and having in the king of Sardinia a military protector, was the scheme he devised for the unity and regeneration of his country. These views he elaborately developed in *Del Primato Civile e Morale degli Italiani*. Its publication in Paris in 1843 was hailed with the utmost enthusiasm in Italy, and his fame was still further enhanced by his work *Il Gesuita Moderno* (1846-47), directed against the Jesuit order. On his return to Italy in 1848 he was received with universal ovations from all classes of the people, was chosen by both Turin and Genoa as their representative in parliament, was appointed senator by the king, and subsequently elected president of the chamber of deputies, and finally prime-minister. As a statesman, however, he was not successful, and after a few weeks' tenure of office he resigned. Being shortly afterwards despatched to Paris on a political mission, he finally settled there and devoted himself exclusively to literary pursuits. He died at Paris of apoplexy, 26th October 1852. His chief writings besides those mentioned are *Teorica del Soprannaturale* (1838), a work against what he regarded as the philosophical errors of his countryman Rosmini (1842), *Del Rinnovamento Civile d'Italia* (1851), *La Filosofia della Rivelazione* (1856), and *Della Protologia* (1857). In philosophy he stood somewhat apart from most schools, though cherishing Platonic sympathies; his works, though Christian and religiously orthodox, were placed on the Index. In 1856-63 Massari published in 11 vols. the *Opere Inedite* of Gioberti. See Massari, *Vita di Gioberti* (1848); Spaventa, *La Filosofia di Gioberti* (1864); and Berti, *Gioberti* (1881).

Gioja del Colle, a town of Italy, 33 miles by rail S. of Bari, has a trade in corn, wine, and oil, and 16,573 inhabitants.

Giordano, LUCA, an Italian painter, was born at Naples, about 1632, studied under Ribera in that town, and afterwards under Cortona at Rome. Subsequently he visited the principal centres of painting in Italy. Giordano acquired the power of working with extreme rapidity (whence his nickname Fa-Presto, 'Make-haste'), and of imitating the style of most of the great masters. Consequently much of his work is hurried and superficial. In 1692 he proceeded to Madrid, at the request of Charles II. of Spain, who desired his assistance in the embellishment of the Escorial. On the death of Charles in 1700 Giordano returned to Naples, where he died, 12th January 1705. His finest frescoes are to be found in the Treasury of the Certosa, near Pavia, and in the church of San Lorenzo, in the Escorial; his best pictures are 'Christ expelling the Traders' and 'Francis Xavier' (Naples), a Nativity (Madrid), the 'Judgment of Paris' (Berlin), and several in the gallery at Dresden.

Giorgione (i.e. 'Great George'), the name conferred, by reason of his stature and his artistic eminence, on Giorgio Barbarella, who was born about 1477, near Castelfranco, in the Venetian province of Treviso, the illegitimate son, as it is believed, of a member of the Barbarella family by a peasant girl of Vedelago. At an early age he came to Venice, and studied painting under Giovanni Bellini, where Titian was his fellow-pupil. He soon attained fame as a painter, developing a manner freer and larger in handling and design than that of his master, and characterised by intense poetic feeling, by great beauty and richness of colouring, and by a constant reference to nature, as is very visible in the landscape backgrounds of his figure-pieces, in which he introduced the scenery that surrounded his birthplace. While still young he executed portraits of Gonzalvo of Cordova, of the Doges Agostino Barbarigo and Leonardo Loredano, and of Queen Cornaro of Cyprus, who then resided at Asolo, not far from Castelfranco; but these works have disappeared. One of the earliest of his productions that have survived is an 'Enthroned Madonna with SS. Francis and Liberale,' an altarpiece commissioned, probably in 1504, by Tuzio Costanzo for the church of Castelfranco—where Giorgione also executed frescoes. These latter perished when the edifice was destroyed, but the altarpiece is still preserved in the new church. It has been reproduced by the Arundel Society, and the oil study for its figure of S. Liberale is in the National Gallery, London. In Venice also Giorgione was extensively employed in fresco-painting, decorating in this manner the exterior of his own house in the Campo di San

Silvestro, of the Soranzo Palace, of the palace of Andrea Loredano, of the Casa Flangini, and, along with Titian, of the Fondaco de' Tedeschi when it was rebuilt in 1506. Some fragments of the last-named frescoes are all that now remains of his work of this nature. The critics are much divided as to the easel-pictures which may be correctly attributed to Giorgione, and the best authorities reject by far the greater number that bear his name in the various public galleries. The picture known as 'The Family of Giorgione,' in the collection of the late Prince Giovanelli at Venice; that titled 'The Three Philosophers,' in the Belvedere, Vienna; and the 'Sleeping Venus,' in the Dresden Gallery, are admittedly genuine: but we can no longer regard as undoubtedly from his brush even such noble compositions as the 'Concert Champêtre' of the Louvre, and that 'Concert' of the Pitti which seems to embody the very spirit of music, an art to which, as we learn from Vasari, the painter was devoted, his skill as a singer and lute-player having procured his admission into the most distinguished circles of Italian society. The former is now attributed by Crowe and Cavalcaselle to the school of Del Piombo, and the latter—which these authorities esteem one of the greatest of the master's pictures—is regarded by Morelli as 'for certain not a work of Giorgione,' but probably an early and much repainted production of Titian. Giorgione died at Venice in 1511, in his thirty-fourth year. He ranks with the very greatest of Venetian painters, and his example powerfully influenced such of his contemporaries as Sebastian del Piombo, Pordenone, and even Titian himself.

Giotto di Bondone, one of the greatest of the early Italian painters, and also celebrated as an architect, was born probably in 1266, though Vasari gives the year as 1276, at the village of Vespignano, 14 miles from Florence. At the age of ten he was discovered by Cimabue, tending his father's flocks, and drawing one of the lambs upon a flat stone, and was by him taken to Florence and instructed in art. The master was then at the height of his fame; he had infused new life into the old Byzantine forms which were current in the art of the time, introducing more of nature, and greater variety and truth of form and expression; and the changes which he inaugurated were, with far greater power, carried towards perfection by his gifted pupil, who introduced a close imitation of nature, a vivid and dramatic realisation of subject, more satisfying and varied composition, a broader distribution of masses, and greater lightness of colouring. The first of Giotto's independent works, such as those which Vasari states that he executed in the Badia of Florence, have perished; and the earliest that have been preserved are a series of twenty-eight frescoes, scenes from the life of St Francis, in the aisle of the Upper Church at Assisi. The 'St Francis in Glory,' and the noble allegorical subjects of 'Poverty,' 'Chastity,' and 'Obedience,' on the ceilings of the Lower Church, mark the increasing strength of the painter. They are assigned by Crowe and Cavalcaselle to the year 1296, though probably they are the work of a later period. Two years afterwards he was employed in Rome by the Cardinal Stefaneschi, designing among other works the mosaic of the 'Navicella,' which, utterly restored, may still be seen in the vestibule of St Peter's. In 1300–2 we trace him at work in Florence, taking part in the execution of a series of frescoes—a 'Paradise,' an 'Inferno,' and scenes from the life of Saints Magdalen and Mary of Egypt, in the Bargello (now the Museo Nazionale). In the 'Paradise' he introduced portraits of Brunetti Latini, Corso Donati the celebrated Neri leader, Charles of Valois, Cardinal d'Acquasparta, and, above all, a profile likeness of his friend Dante, whose acquaintance he had made in Rome, and who refers to the painter in canto xi. of the *Purgatorio*. These works were long concealed by whitewash, which was removed in the 19th century. The head of Dante has been repainted in an incorrect and misleading manner; but an accurate tracing had previously been made by Mr Seymour Kirkup, and this has been reproduced by the Arundel Society.

The next great series of works by Giotto is the frescoes in the Annunziata dell' Arena Chapel, founded by Enrico Scrovegni at Padua. Here we find the artist rising to his highest power, and realising the scenes of sacred history and legend with a directness and an intensity such as had not hitherto appeared in Italian art. The frescoes comprise thirty-eight subjects from the lives of the Virgin and Christ, as related in the apocryphal and canonical gospels, a 'Christ in Glory,' a 'Last Judgment,' and a series of fourteen single figures personifying the cardinal virtues and their opponent vices. In 1306, during the progress of these works, Dante, then in exile, visited Giotto at Padua, and it has been believed that the treatment of the symbolical subjects, which are executed with extreme care, doubtless entirely by the master's own hand, embodies suggestions received from the great poet. Engravings of the Arena Chapel frescoes, with valuable letterpress by Mr Ruskin, have been published by the Arundel Society. No traces survive of the works which, according to Vasari, Giotto afterwards executed in Verona and Ferrara; but the frescoes with which, after 1307, he decorated the Peruzzi and Bardi Chapels in the church of Santa Croce, Florence, have been disclosed by the removal of the whitewash which concealed them for nearly two centuries, and which still covers his works in the Giugni and the Tosinghi and Spinelli Chapels in the same church. The Peruzzi frescoes, scenes from the lives of St John the Baptist and St John the Evangelist, mark the culminating point of the painter's genius—they are masterpieces which 'clear contemporary admirers from the charge of exaggerated admiration and unwarranted flattery,' and 'justify all that has been said respecting the grandeur of his style.' The noble 'Coronation of the Virgin,' in tempera upon panel, in the Baroncelli Chapel of Santa Croce, is another work of about the same period. From 1330 to 1333 Giotto was employed in Naples by King Robert. Here he exercised a powerful influence upon artistic production, but only one fragment from his hand—a fresco in the old convent of Santa Chiara—remains; the subjects of 'The Seven Sacraments' in the Chapel of the Incoronata being now attributed to an unknown follower of the painter. In 1334 he was appointed master of works of the cathedral and city of Florence. Aided by Andrea Pisano he decorated the façade of the cathedral with statues, and designed the exquisite isolated Campanile (q.v.) and the vivid bas-reliefs which adorn its base. This tower was completed after his death, at Florence, 8th January 1336.

The personal anecdotes of Giotto that have been preserved by Boccaccio, Sacchetti, and other writers, show him to have been a shrewd homely personage, with an excellent sense of humour, and a ready power of repartee. Vasari tells the often-quoted story of 'the O of Giotto'—how when the pope sent a messenger to ask the painter for a specimen of his art in view of a proposed commission, 'Giotto, who was very courteous, took a sheet of paper and a pencil dipped in red colour, then resting his elbow on his side, to form a sort of compass, with one turn of his hand he drew a circle so perfect and exact that it was a marvel to behold,' and handed this to the courtier as a sufficient

proof of his technical skill. In spite of some discrepancies of detail there appears to be a basis of truth in the story, which has originated the Italian phrase, 'As round as Giotto's O.' See H. Quilter's *Giotto* (Lond. 1880).

Giovinazzo, an Italian town on the shore of the Adriatic, 14 miles WNW. of Bari by rail. It is an episcopal seat. Pop. 9797.

Gippsland, one of the four important districts into which Victoria, Australia, is divided, is so named after an early governor. It forms the south-east portion of Victoria, and has an area of 13,898 sq. m. Its length from west to east is 250 miles, and mean breadth about 80. It was originally called Caledonia Australis by Mr Macmillan, its first explorer (1839).

Gipsies. See GYPSIES.

Giraffe, or CAMELOPARD (*Camelopardalis Giraffa; giraffa*, the Spanish name, being derived from the Arabic *zarafa*, and that, apparently, from the Egyptian *serapha*, 'long neck'), the tallest of quadrupeds, ranked by some naturalists among deer (Cervidæ), but more properly regarded as constituting a distinct family of ruminants, which contains, however, only one species. It is a native of Africa, south of the Sahara. It occurs generally in small herds of from five to forty. It feeds on the leaves and small branches of trees. Its general aspect is remarkable from the height of the foreparts and great elongation of the neck, the head being sometimes 18 feet from the ground. The number of vertebræ in the neck, however (seven), is not greater than in other quadrupeds, and it has no extraordinary flexibility, although its form and movements are very graceful. The body is short, and the back slopes from the shoulder to the tail; yet the greater height of the foreparts is not entirely owing to the greater length of the fore-legs, but to the neural processes of the vertebræ, which form a basis for the support of the neck and head. The articulation of the skull to

Giraffe (*Camelopardalis Giraffa*).

the neck is such that the head can be easily thrown back until it is in the same line with the neck, thus giving the animal additional power of reaching its appropriate food. The skull has empty cavities, which give lightness to the head, along with sufficient extent of surface for the insertion of the ligament which supports it. The legs are long and slender; the feet have cloven hoofs, but are destitute of the small lateral toes or spurious hoofs which occur in other ruminants. The head is long; the upper lip entire, projecting far beyond the nostrils, and endowed with considerable muscular power. The tongue is remarkably capable of elongation, and is an organ of touch and of prehension, like the trunk of an elephant; it can be thrust far out of the mouth, and employed to grasp and take up even very small objects; it is said that its tip can be so tapered as to enter the ring of a very small key. The usefulness of such an organ for drawing in leaves and branchlets to the mouth is obvious. The giraffe adroitly picks off the leaves of acacias and other thorny plants, without taking the thorns into its mouth. The dentition of the giraffe agrees with that of antelopes, sheep, goats, and oxen; the upper jaw of the male is destitute of the canine teeth which are present in the male of most kinds of deer.

The head is furnished with two remarkable protuberances between the ears, generally described as horns, but very different from the horns of other animals, and each consisting of a bone united to the skull by an obvious suture, permanent, covered with skin and hair, and terminated by long hard bristles. These long outgrowths may correspond to the long core of the antelope's horn or to the pedicel of the antler in the deer. There is also a projection on the forehead. The ears are moderately long; the tail is long, and terminates in a tuft of long hair. There is a callosity on the breast. The neck has a very short mane. The hair is short and smooth; the colour is a reddish-white, marked by numerous dark rusty spots. Its nostrils have a muscle by which they can be closed; a provision, as Owen supposes, for excluding particles of sand. It is an inoffensive animal, and generally seeks safety, if possible, in flight, although it is capable of making a stout resistance, and is said to beat off the lion. It fights by kicking with its hind-legs, discharging a storm of kicks with extraordinary rapidity. It is not easily overtaken even by a fleet horse, and has greatly the advantage of a horse on uneven and broken ground. Its pace is described as an amble, the legs of the same side moving at the same time. The giraffe was known to the ancients, and was exhibited in Roman spectacles. Representations of it appear among Egyptian antiquities. It has been supposed to be the *zemer* of the Jews, translated *chamois* in the English Bible (Deut. xiv. 5). In the year 1836 giraffes were first added to the collection in the gardens of the Zoological Society of London, and since that year numerous specimens have been acquired which have bred in the gardens. They are fed chiefly on hay placed in high racks, greatly enjoy carrots and onions, and a lump of sugar is a favourite delicacy. The flesh of the giraffe is said to be pleasant, and its marrow is a favourite African delicacy.

Giraldus Cambrensis, the usual literary name of the historian and ecclesiastic, Girald de Barri, who flourished in the 12th and 13th centuries, and was born about 1147 in Pembrokeshire, son of a Norman noble who had married into a princely Welsh family. He was brought up by his uncle, the Bishop of St Davids, was sent to the university of Paris in his twentieth year, and after his return entered into holy orders in 1172, and was appointed archdeacon of St Davids. He was from the first a zealous churchman, strenuous in the enforcement of discipline, and especially of clerical celibacy, and was the chief agent in establishing the payment of tithes within the principality. On the death of his uncle, the chapter of St Davids elected him bishop, but, as the election was made without the royal license, Girald renounced it. King Henry II. directed a new election; and, on the chapter's persisting in their choice of Girald, the king refused

to confirm the selection, and another bishop was appointed. Girald withdrew for a time to the university of Paris, and on his return was required by the Archbishop of Canterbury to take the administration of the diocese of St Davids, which had utterly failed in the hands of the bishop. He held it for four years. Being appointed a royal chaplain, and afterwards preceptor to Prince John, he accompanied that prince in 1185 in his expedition to Ireland, where he remained after John's return, in order to complete the well-known descriptive account of the natural history, the miracles, and the inhabitants of that country—his *Topographia Hiberniæ*. His *Expugnatio Hiberniæ* is an account of the conquest of that country under Henry II. Both are works of very great merit—this latter Brewer describes as 'a noble specimen of historical narration, of which the author's age furnished very rare examples.' In 1188 he attended Baldwin, Archbishop of Canterbury, in his progress through Wales to preach a crusade, and worked up his observations into the *Itinerarium Cambriæ*. His later years were darkened by disappointment. On the see of St Davids again becoming vacant, he was again unanimously elected by the chapter; but Archbishop Hubert of Canterbury interposed, and Girald, spite of three different journeys to Rome, failed to get the nomination confirmed. He devoted the remainder of his life to study, and died at St Davids in 1222. The writings of Giraldus Cambrensis, although disfigured by credulity and by excessive personal vanity, are of great value as materials for the history and for the social condition of his age. A translation of the *Itinerarium Cambriæ* was published in 1806 (2 vols.); the complete works have been edited by J. S. Brewer, J. F. Dimock, and G. F. Warner (8 vols., Rolls series, 1861-91). See Owen, *Gerard the Welshman* (1889).

Girard, Stephen, miser and philanthropist, was born near Bordeaux, 24th May 1750, and was successively cabin-boy, mate, captain, and part owner of an American coasting-vessel. In 1769 he settled as a trader in Philadelphia, where ultimately he established a bank which became the mainstay of the United States government during the war of 1812–14, and advanced several millions to the treasury. He died 26th December 1831, leaving a large fortune to charities. Girard was a man of few friends, crabbed and unapproachable, in religion a sceptic, in personal habits a miser, as a master exacting and hard, as a debtor not unwilling to escape payment where a legal technicality enabled him to avoid a just claim. Yet in the yellow fever epidemic in 1793 he nursed many of the sick in the hospitals; and in public matters his generosity was remarkable. Among other bequests he left $2,000,000 for the erection and maintenance in Philadelphia of a college for male white orphans; no minister of any sect whatever was to be on its board, or even to enter the premises as a visitor. The principal building (1833–47), a magnificent Greek temple, and the nine subsidiary buildings, have accommodation for 1580 pupils.

Girardin, Émile de, a French journalist and politician, the illegitimate son of the royalist general Alexandre de Girardin and Madame Dupuy, was born in Switzerland in 1806, and educated in Paris. He bore the name of Delamothe until 1827, when he assumed that of his father, who acknowledged him in 1847; and his first attempt in literature was a novel, *Émile*, in which he pleaded the cause of adulterine children. After the July revolution (1830) he established the *Journal des Connaissances Utiles*, which attained a sale of 120,000 copies; other cheap magazines followed, but he did not carry out his idea of a halfpenny newspaper until 1836, when he founded the *Presse*, an Orleanist journal with Conservative leanings. Its rivals accused it of being subsidised by the government, and one of the unfortunate results of the quarrels thus fastened on Girardin was his duel with Armand Carrel, editor of the *National*, in which the latter fell. From this time onward to the Revolution of 1848 Girardin was ardently occupied with politics, both as a journalist and a deputy, and gradually became a decided republican. He promoted Louis Napoleon's election to the presidency, but disapproved of the *coup d'état*, and was rewarded with a short period of exile. He next threw himself into the arms of the Socialists. In 1856 he sold his share of the *Presse*, but became its editor again in 1862, eventually abandoning it for the direction of the *Liberté*, which he maintained till 1870. He excelled his fellows in braggadocio on the outbreak of the Franco-Prussian war; and during the Commune he proposed a scheme for splitting up the republic into fifteen federal states. In 1874, however, he founded the *France*, and both in its pages and in the *Petit Journal* supported the republic. He wrote a few pieces for the stage; his political ideas he gave to the world in a host of brochures. Girardin died 27th April 1881.—His first wife, whose maiden name was Delphine Gay (1805–55), enjoyed for many years a brilliant reputation as a poetess and beauty, and also wrote several novels and plays. Her best-known work is *Lettres Parisiennes*, which appeared in the *Presse*, under the pseudonym of Vicomte de Launay, in 1836–48. Her complete works fill 6 vols. (1860–61). See Imbert de Saint-Amand, *Madame de Girardin* (Paris, 1874).

Girardin, François Saint-Marc, a French journalist and professor, was born at Paris in 1801, studied at the Collége Henri IV. with brilliant success, and in 1827 obtained a mastership in the Collége Louis-le-Grand. After two visits to Germany he published a report on the state of education there, and *Notices politiques et littéraires sur l'Allemagne;* in 1834 he was called to the chair of Literature at the Sorbonne, and became leader-writer for the *Journal des Débats*, distinguishing himself under the July monarchy as a ready combatant and resolute enemy to the dynastic and democratic opposition. He was elected a member of the Academy in 1844. His parliamentary career (1834–48) was not noteworthy; and under the Second Empire he retained his chair at the Sorbonne, where his lectures, following the orthodox lines of criticism, were very popular. He became a member of the National Assembly in 1871, and died near Paris, 11th April 1873. Besides his numerous contributions to the *Débats*, some collected in *Essais de Littérature* (2 vols. 1845), he published several large works, among them his *Cours de Littérature dramatique* (1843; 11th ed. 1875–77), being his sixty-three lectures for a period of twenty years, and *Souvenirs et Réflexions politiques d'un Journaliste* (1859). See Tamisier, *Saint-Marc Girardin, Étude littéraire* (1876).

Girasol, a precious stone, exhibiting in strong lights a peculiar and beautiful reflection of bright red or yellow light, which seems to come from the interior of the stone. From this it derives its name (Ital., 'sun-turning'). There are different kinds of girasol, variously referred by mineralogists to quartz and opal, species which, however, are very nearly allied. One kind is also known as *Fire Opal*, which is found only at Zimapan, in Mexico, and in the Faroe Islands. The Mexican specimens are of a rich topaz yellow colour, and the reflection is very bright. Another kind is the *Quartz Resinite* of Haüy, so called because of its characteristic resinous fracture. It is found of various colours, sometimes of a fine yellow or emerald green, more

generally bluish white. For a specimen of extraordinary brilliancy, not an inch and a half in diameter, £1000 has been refused. The ancients held this stone in high estimation, and called it *Asteria* (Gr. *aster*, 'a star'). They obtained it both from Caramania and from India. The brightest are at present brought from Brazil, but fine specimens are also obtained in Siberia. Imitation girasols are made of glass in which a little oxide of tin is mixed.—The name girasol is sometimes given to a kind of sapphire, also called *Asteria sapphire*, exhibiting a similar reflection of light, and sometimes to *Sunstone*, an avanturine felspar. According to Castellani, many minerals can be made to reflect light from the interior in the same way as girasol, when they are carefully cut in a spherical or semi-spherical form. He instances adularia, hydrophane (a variety of opal), milky corundum, some kinds of chalcedony, Brazilian chrysolite, &c.

Girder, a beam of wood, iron, or steel used to support joisting walls, arches, &c., in building various kinds of bridges. See BRIDGE; STRENGTH OF MATERIALS.

Girgeh, a town of Egypt, is situated on the left bank of the Nile, in 26° 20′ N. lat. and 31° 58′ E. long., 10½ miles N. of the ancient Abydus. The town is being gradually undermined by the river. It was here that the discontented Mamelukes rallied against Mehemet Ali. Outside the town is a Roman Catholic monastery, said to be the oldest in Egypt. Pop. 15,500. Girgeh is the capital of a province, which has an area of 9200 sq. m., and a pop. of 530,000.

Girgenti, a town of Sicily, built on an eminence overlooking the sea, near the site of the ancient Agrigentum (q.v.), and situated on the south coast, 84 miles by rail SSE. of Palermo. The town is the seat of a bishop and of the prefect and other officials of the province, and has a trade in grain, oil, fruit, sulphur, sumach, salt, and fish. Its port is Porto Empedocle. Pop. 20,000. The province, with an area of 1172 sq. m., has a pop. (1895) 345,700.

Girnar, a sacred mountain in India, stands in the peninsula of Kathiawar, Bombay province, 10 miles E. of Junagarh. It is a bare and black rock of granite rising to the height of 3500 feet above the sea; and, as a holy place of Jainism, is covered with ruined temples. One group contains sixteen temples, nearly 3000 feet above the sea.

Gironde, a maritime department in the south-west of France, is formed out of part of the old province of Guienne. Area, 3760 sq. m.; pop. (1872) 705,149; (1886) 775,845; (1891) 793,528. It is watered by the Garonne and the Dordogne, and by the Gironde, the estuary formed by the union of these two rivers. The eastern two-thirds of the surface consist of a fertile hill and dale region; the remainder, in the west next the ocean, belongs to the Landes (q.v.). In the east and north-east the soil is chiefly calcareous. Wine, including the finest clarets, is the staple product of the department, several million gallons being produced annually. Grain, vegetables, potatoes, pulse, and fruit are grown largely. On the downs or sand-hills of the west coast there are extensive plantations of pine, from which turpentine, pitch, and charcoal are obtained. The shepherds used to traverse the Landes (q.v.) on high stilts, and travel with them also to markets and fairs. Principal manufactures, salt, sugar, wax candles, porcelain and glass, chemical products, paper, and tobacco. The department includes the six arrondissements of Bazas, Blaye, Bordeaux, Lesparre, Libourne, and Réole. Bordeaux is the capital.

Girondists (Fr. *Girondins*), the moderate republican party during the French Revolution. From the first they formed the Left in the Legislative Assembly, which met in October 1791, and though inclined towards republicanism were yet devoted to the new constitution as it stood. The name was due to the fact that its earliest leaders, Vergniaud, Guadet, Gensonné, Grangeneuve, and the young merchant, Ducos, were sent up as representatives by the Gironde department. Early in 1792 the reactionary policy of the court and the dark clouds lowering on the horizon of France made the king's ministers so unpopular that Louis was fain to form a Girondist ministry, with Roland and Dumouriez as its chiefs. Ere long, however, they were dismissed—a measure which led to the insurrection of the 20th June 1792. The advance of the Austrian and Prussian invaders threw the influence into the hands of the Jacobins, who alone possessed vigour enough to 'save the revolution.' The great *émeute* of the 10th August finally assured their triumph, which vented itself in such infamies as the September massacres. Next followed the National Convention and the trial of the king. The Girondists tried to save the king's life by appealing to the sovereign people. The fall of Roland and the ascendency of Robespierre followed. Dumouriez, to save his head, rode over into the Austrian camp, and the famous Committee of Public Safety was created. Of its members not one was a Girondist. The last effort of the party was an ineffectual attempt to impeach Marat, who, however, on the 2d July overthrew the party, arresting as many as thirty-one deputies. The majority had already escaped to the provinces. In the departments of Eure, Calvados, all through Brittany, and at Bordeaux and elsewhere in the south-west the people rose in their defence, but the movement was soon crushed by the irresistible energy of the Mountain, now triumphant in the Convention.

On the 1st October 1793 the prisoners were accused before the Convention of conspiring against the republic with Louis XVI., the royalists, the Duke of Orleans, Lafayette, and Pitt, and it was decreed that they should be brought before the Revolutionary Tribunal. On the 24th their trial commenced. The accusers were such men as Chabot, Hébert, and Fabre d'Eglantine. The Girondists defended themselves so ably that the Convention on the 30th was obliged to decree the closing of the investigation. That very night, Brissot, Vergniaud, Gensonné, Ducos, Fonfrède, Lacaze, Lasource, Valazé, Sillery, Fauchet, Duperret, Carra, Lehardy, Duchâtel, Gardien, Boileau, Beauvais, Vigée, Duprat, Mainvielle, and Antiboul were sentenced to death, and, with the exception of Valazé, who stabbed himself on hearing his sentence pronounced, all perished by the guillotine. On their way to the Place de Grève, in the true spirit of French republicanism, they sang the *Marseillaise*. Coustard, Manuel, Cussy, Noel, Kersaint, Rabaut St Etienne, Bernard, and Mazuyer went later to the same fate. Biroteau, Grangeneuve, Guadet, Salles, and Barbaroux ascended the scaffold at Bordeaux: Lidon and Chambon at Brives; Valady at Perigueux; Duchezeau at Rochelle. Rebecqui drowned himself at Marseilles, Pétion and Buzot stabbed themselves, and Condorcet poisoned himself. Sixteen months later, after the fall of the Terrorists, the outlawed members, including the Girondists Lanjuinais, Defermon, Pontécoulant, Louvet, Isnard, and La Rivière, again appeared in the Convention. See Lamartine's *Histoire des Girondins* (8 vols. Paris, 1847); and Guadet's *Les Girondins* (new ed. 1889).

Girtin, THOMAS, one of the greatest of the earlier English landscape-painters in water-colours, was born in London, 18th February 1775, and died 9th November 1802. He was a close friend and

fellow-student of Turner; and to them many improvements in water-colour painting are due. Girtin struck out a bolder style than had been attempted, attained great richness of colour and breadth, but was somewhat careless of detail, and sometimes inaccurate in drawing. His best works are panoramic views of London and of Paris.

Girton College, the most notable college for women in England, was instituted at Hitchin in 1869, but removed to Girton, near Cambridge, in 1873. Instruction is given in divinity, modern languages, classics, mathematics, moral science, natural science (including physiology and chemistry), history, vocal music. There are about thirty lecturers, mostly connected with Cambridge University. The mistress and five resident lecturers are ladies. The students, who number above 100, are admitted after an entrance examination; the ordinary course extends over three years, half of each year being spent in college. 'Degree Certificates' are granted to those who satisfy their examiners as to their proficiency according to the standard of the examinations for the B.A. of Cambridge University; £35 per term covers all college charges.

Girvan, an Ayrshire seaport and burgh of barony, is at the mouth of the river Girvan, and 21 miles SSW. of Ayr by rail. The harbour is small, but has been improved since 1881. The valley of the Girvan is one of the most fertile and best-cultivated districts in the south of Ayrshire. The town is opposite Ailsa Craig (which is 10 miles W.), was once a thriving seat of weaving, and is now frequented for sea-bathing. Pop. (1851) 7306; (1891) 4081.

Gisborne, a post-town of New Zealand, in the North Island, is situated on the river Turanganui (fine bridge, 1885), 250 miles SE. of Auckland, with which city it has steamer communication. It is the port of entry for Poverty Bay, a name given by Captain Cook in 1769, and sometimes still retained for the town; only small vessels can come up to the wharves, but in 1889–96 a harbour costing £200,000 was constructed. The country round is a rich dairy region, and in 1886 petroleum was struck in the neighbourhood. Pop. 2158.

Gisors, a town in the French department of Eure, on the Epte, 43 miles NW. of Paris by rail. Its double-aisled church, whose choir dates from the 13th century, has a splendid flamboyant portal; and the octagonal donjon of the ruined castle was built by Henry I. of England. Here Richard I. defeated the French in 1198; his watchword, *Dieu et mon Droit*, has ever since been the motto of the royal arms of England. Pop. 3960.

Gitschin (Czech *Jicin*), a town of Bohemia, 60 miles by rail NE. of Prague, with 8071 inhabitants, who manufacture sugar and carry on agriculture. Gitschin was once the capital of the duchy of Friedland, and here Wallenstein built a splendid palace (1630). On 29th June 1866 the Austrians were severely defeated here by the Prussians.

Giugliano, a town of Italy, 8 miles NW. of Naples, with a trade in corn and grapes. Pop. 11,748.

Giulio Romano. Giulio Pippi de' Giannuzzi, the chief pupil of Raphael, and after his death head of the Roman school, was born at Rome about 1492—some authorities say 1498. His excellence as an architect and engineer almost equalled his genius as a painter. Giulio assisted Raphael in the execution of several of his finest works, such as the series of the so-called Raphael's Bible in the loggie of the Vatican and the 'Benefactors of the Church' in the Incendio del Borgo, and at Raphael's death he completed the 'Battle of Constantine' and the 'Apparition of the Cross' in the Hall of Constantine in the Vatican. He likewise inherited a great portion of Raphael's wealth and his works of art. The paintings executed by Giulio in imitation of Raphael reflect not only the style and character, but the sentiment and spirit of the master; but, on the other hand, his more original creations are deficient in the ideal grace of Raphael, and display rather breadth and power of treatment and boldness of imagination than poetical refinement or elevation. With a thorough knowledge of design he combined a facile skill in composition and a thorough appreciation of classical ideals. Before he left Rome he built the Villa Madama, and adorned it with a fresco of Polyphemus. About the end of 1524 Giulio accepted the invitation of Federigo Gonzaga, Duke of Mantua, to proceed thither and carry out a series of architectural and pictorial works. The drainage of the marshes surrounding the city, and the protection of it from the frequent inundations of the rivers Po and Mincio, attest his skill as an engineer; while his genius as an architect found scope in the restoration and adornment of the Palazzo del Te, the cathedral, the streets, and a ducal palace at Marmirolo, a few miles from Mantua. Amongst the pictorial works of this period were the 'History of Troy,' in the castle, and 'Psyche,' 'Icarus,' and the 'Titans,' in the Te palace. In Bologna, too, he designed the façade of the church of S. Petronio. Perhaps the best of his oil-pictures are the 'Martyrdom of St Stephen' (at Genoa), 'A Holy Family' (Dresden), 'Mary and Jesus' (Louvre), and the 'Madonna della Gatta' (Naples). Giulio died at Mantua, 1st November 1546. See D'Arco's *Vita e Opere di Giulio Romano* (1842).

Giurgevo (Roumanian *Giurgiu*), a town of Roumania, on the left bank of the Danube, directly opposite Rustchuk, 40 miles by rail SSW. of Bucharest, of which town it is the port. It imports iron and textile goods, coal, and spirits, and exports corn, salt, and petroleum. It was originally settled by the Genoese in the 14th century, who called it St George. Since 1771 the town has played an important part in all the wars between the Turks and the Russians. Pop. 15,300.

Giusti, GIUSEPPE, political poet and satirist, was born 12th May 1809, at Monsummano, near Pistoia. He studied law at Pisa, and for a time practised at Florence; but from 1830 onwards found his sphere as a keen and incisive satirist, writing in brilliant and popular style a series of poems, in which the enemies of Italy and the vices of the age were mercilessly denounced. But it was not till 1848 that he published a volume of verse under his own name. Save in satire his work is second-rate. He was elected a member of the Tuscan chamber of deputies in 1848, and died 31st March 1850. Among his most notable poems (all short) were *Il Dies Iræ* (1835), *Lo Stivale* (1836), *Girella* (1840), *Sant' Ambrogio* (1844). Editions of his works were published in 1863 and 1877. See Fioretto, *Giuseppe Giusti* (1877).

Givet, a frontier town and first-class fortress in the French department of Ardennes, on both banks of the Meuse, 31 miles by rail S. of Namur in Belgium, and 193 NE. of Paris. The citadel of Charlemont, on a rock 700 feet above the stream, was reconstructed by Vauban. There are manufactures of lead-pencils, and sealing-wax, copperwares, soap, &c. Pop. 6818.

Givors, a smoky town in the French department of Rhone, on the right bank of the Rhone, 14 miles S. of Lyons by rail. Glass, especially bottles, and silk and iron goods are extensively manufactured, and a considerable trade in coal is carried on. Pop. 10,100.

Gizeh, or GHIZEH, a small town in Egypt, on the opposite side of the river from Old Cairo, and approached from Cairo by the great swinging bridge constructed over the Nile in 1872. It is but a poor place, with a pop. of some 10,500. Artificial egg-hatching has been practised here since the days of the Pharaohs. Since 1889 the museum of Egyptian antiquities, formerly at Boulak, has been housed here. The Pyramids (q.v.) of Gizeh (also spelt Giza) lie five miles to the west.

Gizzard. See BIRD.

Glacial Period, or ICE AGE, is a term used in geology to designate that period the records of which are included in the Pleistocene System (q.v.). 'Glacial period' and 'Pleistocene period' are in fact synonymous as regards all northern and temperate regions—the former term being used when the prominent climatic characteristics of the period are thought of, while the latter is employed with reference to its life. The chief geographical and climatic changes of this period, and the general features of its fauna and flora, will be considered under PLEISTOCENE SYSTEM. But here a short account may be given of the relics which furnish evidence of former glacial conditions having obtained in many regions that are now in the enjoyment of temperate climates. It is chiefly in the northern parts of Europe and North America, and the hilly and mountainous districts of more southern latitudes, that the glacial deposits, properly so called, are developed. These deposits consist partly of morainic materials, erratics, &c., and partly of marine, fresh-water, and terrestrial accumulations. The most important member of the series is *Boulder-clay* (q.v.), or, as it is often termed, *till*. This is an unstratified clay, full of ice-worn stones and boulders, which is believed to have been formed and accumulated under glacier-ice. Several distinct and separate sheets of boulder-clay have been recognised, divided from each other by intercalated 'interglacial beds,' which last are often fossiliferous. The lowest and oldest boulder-clay covers vast areas in the British Islands and northern Europe extending south as far as the Bristol Channel and the valley of the Thames in England, and to the foot of the Harz Mountains, &c., in middle Germany. Boulder-clay of the same age spreads over the low grounds of Switzerland, and extends from the great Alpine valleys for many miles into the circumjacent low-lying regions. Similar ground-moraines have been met with in all the mountainous and hilly tracts of Europe, as in central France, the Pyrenees, the Spanish Sierras, the mountains of Corsica, the Apennines, the Vosges, the Black Forest, the Erzgebirge and other ranges of Germany, the Carpathians, &c. The rock-surfaces on which the boulder-clay rests are often smoothed and striated, or much crushed and broken, while the hills and mountain-slopes in regions where boulder-clay occurs give evidence of having been abraded and smoothed by glacial action (see ROCHES MOUTONNÉES). At the time the boulder-clay was formed, Scotland, Ireland, the major portion of England, Scandinavia, Denmark, Holland, the larger half of Belgium, Germany as far south as Leipzig, and vast regions in Poland and Russia were covered with a great *mer de glace*. Contemporaneously with this ice-sheet all the mountain-regions of the central and southern regions of the Continent nourished extensive snowfields and glaciers, which last flowed out upon the low ground often for very great distances. Thus, Lyons stands upon old moraines which have been carried down from the mountains of Dauphiné and Savoy. The interglacial deposits point to great changes of climate when the snowfields and glaciers melted away, and temperate conditions of climate supervened, as is shown by the geographical distribution of these deposits, and by the character of the plant and animal remains which they have yielded. The youngest boulder-clay, overlying, as it does, such interglacial beds, proves that the glacial period closed with another advance and final retreat of the Scandinavian ice-sheet and the great glaciers of the Alps, &c. The terminal moraines of the last ice-sheet do not come so far south as those of the first and greatest *mer de glace*. These moraines show that the ice covered the Scandinavian peninsula, filled up the Baltic, invaded north Germany, and overflowed Finland and wide regions in the north of Russia. Similarly in the Alps, &c., the last great extension of the glaciers was not equal to that of the first. See EUROPE.

The boulder-clays are not the only evidence of glacial conditions. Besides those accumulations and the scratched and crushed rock-surfaces already referred to, we encounter numerous erratics (see BOULDERS, ERRATICS), oskers or kames (see ÅSARS, Giants' Kettles (q.v.), clays with Arctic marine shells and erratics (in Scotland, Prussia, &c.)—the organic remains associated with the glacial deposits often affording strong evidence of cold conditions. The following table shows the general succession of the glacial deposits in several parts of Europe:

SCOTLAND—

6. Valley moraines and fluvio-glacial gravels—small local glaciers.
5. Kame-moraines, fluvio-glacial deposits, laid down during retreat of last great ice-sheet.
4. Clays, &c., with Arctic marine shells, reaching up to a height of 1000 feet above present sea-level, and corresponding in age with the *mer de glace*, and underlying the latter to a large extent with these clays.
3. Upper boulder-clay = greatest extension of latest *mer de glace*.
2. Interglacial beds, with appearance of cold conditions; at one place (Kilmaurs) these beds are overlain with unstratified boulder-clay, and at another (Carmyle) they lie at less than 500 or 600 feet below present level.
1. Lower boulder-clay with intercalated interglacial fossiliferous beds = greatest extension of ice. The lowest clay marks the period of greatest glaciation.

ENGLAND AND IRELAND—

6. Valley moraines and fluvio-glacial gravels.
5 and 4. Kame-moraines, erratics, fluvio-glacial deposits.
3. Upper boulder-clay of last great ice-sheet.
2. Interglacial beds, marine and fresh-water. Disappearance of glacial conditions; land-surface at first; subsequent submergence to considerable extent.
1. Lower boulder-clays with intercalated aqueous deposits, corresponding probably with the same formations as 1 in Scottish series.

NORTHERN EUROPE—

4. Sand and gravel, erratics; shelly marine clays (in Baltic area).
3. Upper boulder-clay and terminal moraines of last *mer de glace*.
2. Interglacial beds, partly fresh-water and terrestrial, partly marine.
1. Lower boulder-clay = greatest extension of ice.

SWITZERLAND—

4. Fluvio-glacial gravels in terraces.
3. Moraines and upper boulder-clay of last great glaciers.
2. Interglacial beds, with lignitiferous deposits, &c.
1. Lower boulder-clay.

CENTRAL EUROPE—

4. Fluvio-glacial gravels.
3. Moraines.
2. Interglacial beds, richly fossiliferous.
1. Glacial deposits (Mont Dore).

In North America glacial deposits are developed upon a great scale, and there, as in Europe, the boulder-clays are separated by interglacial deposits. The northern part of the continent was drowned in ice during the greatest extension of the *mer de glace*, the ice flowing south into New Jersey, whence its front extended north-west through Pennsylvania, after which it trended south-west through Ohio and Indiana to reach the 38th parallel of latitude in Illinois. It then appears to have swept away to the north-west in the direction of the Missouri valley. The latest American *mer de glace* did not come so far south—its terminal moraines being well developed in Minnesota, Wis-

consin, Michigan, &c. Evidence of former excessive glacial conditions has been met with in many other parts of the world—old moraines, &c. having been detected in the Caucasus, the mountains of Asia Minor, the Lebanon, the Himalayas, &c. in Asia; in the Atlas, the Kagu and Krome Mountains, &c. in Africa; in the Andes, Tierra del Fuego, &c. in South America; in New Zealand, &c. The probable cause of the glacial period is discussed under PLEISTOCENE SYSTEM.

Glaciation. See GLACIAL PERIOD, GLACIERS.

Glaciers are rivers of snow compacted by pressure into ice, which move slowly from higher to lower levels. In tropical and temperate climates glaciers are found only upon the higher parts of lofty mountains, but at the poles whole continents and great islands are entirely or partially covered by them.

Distribution.—Their distribution is very extensive: they occur in Greenland, which is almost an entire sheet of ice; on the islands between Greenland and North America; in North America towards the centre, in Alaska and dotted along the Pacific coast, and continued down to the extremity of South America; in Europe, in Norway, among the Pyrenees, and along the Alps; in Asia they pervade the Himalayan system, and appear in Japan and on the opposite mainland. The unexplored Antarctic continent is, to all appearance, covered entirely by one great ice-sheet of over 10,000 feet in thickness. Traces of their presence in past geological ages are even more general, appearing as they do over the larger part of North America, the southern portion of South America, all northern Europe, as well as smaller areas in Africa, Australia, New Zealand, &c. Of the 1155 glaciers of the Alps, the longest is the Aletsch, 15 miles in length; the depth of the Aar glacier has been estimated at 1510 feet. Next to the Aletsch among European glaciers is one in the Caucasus.

Position.—At and near the equator a height of 16,000 feet is necessary for the formation of glaciers, but, as cooler regions are approached, the required altitude becomes less and less, until the poles are reached, where the ice-sheets are presented emptying themselves into the ocean. But wherever occurring, they are always greatest and most frequent on eminences of the required height, which first meet the vapour-laden winds coming from the sea, and presenting a side or sides but little exposed to solar influences. Thus, the Himalaya Mountains, being directly in the track of the south-west monsoon, with no intervening heights of any consequence between them and the ocean, first receive its watery burden, with the consequent formation of the great glaciers of that region. In the same way the Andes of South America, meeting the breezes from the Pacific, bear great ice-sheets upon all their more prominent peaks. In New Zealand, while the glaciers of the Mount Cook range reach down to 700 feet above the sea on the west side, they reach only to 2000 feet on the east side.

Movement.—On the higher summits of glacier-bearing mountains the snow lies loose, in granular form and comparatively lightly; but, as it is impelled down the sides of the eminences by gravitation, the pressure of the masses from behind and from the sides gradually hardens and compacts it, until at last the air is driven out, and, the forces from above acting with greater power from increase of weight and impact, the glacier assumes its best-known form—that of a homogeneous concretion of blue, crystalline ice. Thus slowly pushed forward, the glacier continues to descend, until, in the warmer latitudes, a zone is reached where the sun becomes too powerful to be resisted, and the ice melts, thus forming the headwaters of rivers, many of which take their origin in this way. In more rigorous climates the ice-sheets are pushed down to the lowest-lying grounds, until their edges are protruded into the sea, and until a sufficient depth of water is reached to float the buoyant ice, which is now submerged to two-thirds of its thickness. Partly by the action of the swell, partly because of its own weight, the edge becomes detached from the parent mass, and floats out to sea in the form of Icebergs (q.v.). This process of dissolution is known among whalers as 'calving.' But even in the higher latitudes, such as Greenland, where the temperature is always exceedingly low, the ice dissolves and reaches the sea by rivers as well as by icebergs. The melting in such cases is almost entirely due to pressure, the water escaping from below the ice-sheet. The solar influences being weak, even in the height of summer the supply of moisture derived from the exposed surfaces in these regions is small and insignificant.

The edge of the Muir Glacier, Alaska.

Although the onward movement of a glacier is too slow to be perceptible to the eye, it is none the less present and, generally, continuous. J. D. Forbes found (from measurements made by himself in the Mer de Glace, near Chamouni; see ALPS) and first proved that the whole sheet does not possess the same rate of motion, the centre advancing more rapidly than the sides. He discovered that in summer and in the fall of the year the middle of that glacier drew forward at a rate of from 1 foot 8 inches to 2 feet 3 inches, and at the sides at from 1 foot 1 inch to 1 foot 7½ inches per diem. Agassiz at about the same time carried on a series of independent experiments on the glacier of the Aar, and arrived at similar conclusions. Helland later on demonstrated that in Greenland a more rapid motion was to be found, and that the Jacobshafn glacier advanced at a rate of from 48·2 feet to 64·8 feet in the twenty-four hours. This result has lately been generally confirmed, although somewhat modified, by Dr Rink, who, from a considerable

collection of data, concludes that the quickest rate of progress of the centres of the glaciers of that region averages 21 feet in twenty four hours. In many areas in Greenland, however, the limits of the ice-sheets were found to be almost stationary, and prolonged and careful observations became necessary before any progress could be noted. In these cases the configuration of the ground was the principal cause of the more gentle motion. The variation in the rate of movement in different parts of the mass is analogous to that of rivers, and there are many other points of similarity between glaciers and streams of water which will call for notice below.

The above remarks broadly point out the general movements of glaciers, but various modifying agencies are frequently present, which change for a time the regularity of the motion. Thus, when slipping down a steep incline the rate of progress is much more rapid than when level tracts or rising ground are being traversed. The surface of the ice-sheet, too, travels with somewhat greater velocity than the lower strata, and the nature of the glacier's bed here again produces modifications. When the path is smooth and sloping, the rates of speed at which the upper and under portions advance are much more equal than when obstacles intervene, preventing the lower strata from keeping up an equal ratio of motion with the portions nearer to and at the surface. When the ice-sheet turns aside from following a straight course and forms a curve, the maximum of motion is no longer in the centre, but at points along the surface nearer to the convex side of the curve.

In temperate and tropical latitudes the exposed top of the glacier is being continually lowered and reduced by evaporation, and it would appear that, as a general rule, the ice masses in such situations lose more by this process than they gain from the snowfalls of winter. When a series of hot summers and mild winters succeed each other, the amount of ice dissolved and conveyed away in the form of running water exceeds considerably the supply brought down from higher levels by gravitation, and the glacier retreats up its bed or valley. On the contrary, when a succession of cold summers and severe winters are experienced, it pushes itself farther down, and appears, through these effects of the seasons, to possess a kind of elasticity.

When decided inequalities in the ground are passed over, the hollows become filled up with ice belonging to the bottom of the glacier, the superincumbent masses passing over them; in this manner 'ice eddies' are formed. On coming down a sharp declivity the glacier becomes much cracked and fissured, pinnacles and towers become conspicuous, and the whole fall presents a scene of chaotic confusion. No sooner, however, is comparatively level ground again reached than the pressure exerted by the flow from the heights once more asserts itself, and again cakes the shattered fragments into a smooth, solid whole. *Crevasses* are cracks in the ice-sheet, at first narrow, and of no great depth; but as the glacier progresses they increase in size, often assuming the dimensions of huge chasms, frequently reaching from the top to the bottom of the mass and travelling downwards with it, until some temporary stoppage in front presses the edges one against the other, and seals up the orifice.

It has been urged that, when glaciers flow over a level or rising surface, something more than the mere force of gravitation must be sought to account for their forward movement, and the theory has been advanced that water, percolating from the surface through openings into the body of the ice, and there undergoing expansion during the process of freezing, may be a powerful factor in impelling the glacier onwards, where gravitation alone could hardly be sufficient to account for its advance.

Work.—Glaciers have many features in common with rivers. Thus, they have regular drainage areas from which they draw their supplies; they move from higher to lower levels with more or less rapidity as the configuration of the ground varies; the whole mass does not move at the same rate; they carry along with them rocks, boulders, gravel, sand, and earth; they reach the ocean in the forms either of ice or water; and they convey to the sea their burdens of terruginous materials. Their influence upon marine deposits would, in the present state of our knowledge, appear to be very great—greater, indeed, than that of the largest rivers discharging on a bold and little indented coast, and nearly as great as that of large rivers falling into bays and partially enclosed seas. Thus, the continental marine deposits off the shores of Antarctica extend almost as far out into the ocean as those brought down into the Bay of Bengal and Arabian Sea by the Ganges, Indus, and the other great streams of India, and to an infinitely greater extent than those conveyed by the great rivers of the smooth, east coast of Africa, which empty themselves directly into the open ocean.

The formation of *moraines* is one of the most evident phenomena connected with the work of glaciers. They are of three varieties, known as terminal, lateral, and median. A terminal moraine consists of a gathering of boulders, rubbish, &c., pushed down by the advancing ice-sheet and heaped up before it. When the glacier retreats, the moraine is seen to be of a crescent shape, the extremities pointing backwards and the centre pushed more or less forward—evidence of the greater rapidity of motion of the centre than of the sides of the glacier. Lateral moraines are formed by the denudation of the sides of the bed or valley down which the ice-sheet flows. In its forward movement it scrapes off immense quantities of rubbish from the sides, which, falling on the outer edges of the sheet, are carried forward and downward and thrown off laterally. When two glaciers meet, they coalesce and flow onward as one; the lateral moraines at the sides of juncture unite also, and form a medial moraine down the centre of the great trunk glacier. Boulders, so long as they are carried upon the ice-sheets, are in nowise changed by transport, preserving all their angularities and sharp corners. Many of them, however, fall into the crevasses, and, reaching the bottom, are ground and rasped along the rocky bed of the ice-stream. These boulders, as well as the solid rocks they are rubbed over, become polished and striated, and in this way evidence of the presence of glaciers is preserved long after they themselves have disappeared. The water discharged from the extremities of ice-fields is always muddy, heavily charged with a fine powder, produced by the scraping of rock and ice against rock and soil. In the warmer regions, when a glacier protrudes below the snow-line the amount of water melted from the surface is very considerable, often finding its way into a crevasse and uniting with the water already collected there, produced by the higher temperature prevailing in the lower strata of all glaciers, and resulting from the effects of pressure. The falling water in the course of time drives a shaft or tunnel through the ice at the bottom of the crevasse, and these shafts are known as *moulins*. The closing of the crevasse does not necessarily imply the destruction of the moulin, which often remains entire, with a deposit of rubbish, left by the water, all along the bottom, and may come to light again through the opening of a fresh chasm much farther down the glacier.

For particulars and discussions regarding glaciers and

their work, see De Saussure's *Voyage dans les Alpes*; Agassiz' *Etude sur les Glaciers*; Croll's *Climate and Time*; Geikie's *Great Ice Age*; Forbes's *Travels in the Alps*; Tyndall's *Glaciers of the Alps*; Thomson, *Proc. Roy. Soc.*, 1856-57; *Scottish Geog. Mag.*, vol. v.; Heim, *Handbuch der Gletscherkunde* (1885); also Dr Frederick Wright's important work, *The Ice Age in North America* (New York and Lond. 1889). For the influence of glaciers on marine deposits, see maps by Dr John Murray in the *Scottish Geog. Mag.*, vol. v.

Glacis (allied to glade in the sense of a lawn) is the slope of earth, generally 1 in 20, which inclines from the Covered-way (q.v.) of a fortress towards the country. It obliges the assailants to approach over an open space swept by fire from the fortress, and at the same time masks the general works of the place. See FORTIFICATION.

Gladbach, or BERGISCH-GLADBACH, an industrial town of Rhenish Prussia, 8 miles NE. of Cologne. Its industries include the manufacture of drag-nets, paper, papier-maché, and gunpowder, and it has zinc and various other metal works. Peat is cut in the neighbourhood. Pop. 9928.

Gladbach, or MÖNCHEN-GLADBACH, a rapidly growing manufacturing town of Rhenish Prussia, 16 miles W. of Düsseldorf, is the centre of the Rhenish cotton-spinning industry. It has also manufactures of silk, wool, linen, and paper, cotton-printing works, dyeworks, bleachfields, iron-foundries, machine-shops, breweries, and brickworks. Gladbach, which has been a town since 1366, was formerly the seat of an important linen trade; the cotton industry was introduced in the end of the 18th century. The town formerly contained a famous Benedictine abbey, founded in 792, and still possesses a church dating from the 12th and 13th centuries (the crypt from the 8th). Pop. (1858) 13,965; (1871) 26,354; (1890) 49,268, mostly Roman Catholics.

Gladiator (from Lat. *gladius*, 'a sword'), a professional fighter in the arena of a Roman amphitheatre, against either another gladiator or a wild beast. The custom of giving gladiatorial exhibitions seems to have been borrowed from Etruria, where slaves and prisoners were sacrificed on the tombs of illustrious chieftains. This practice was also common in Greece and the East. At Rome the gladiatorial contests took place at first at funerals only, but afterwards in the amphitheatre; and in process of time they lost all trace of a religious character, and came to be a common form of amusement. The first show of this kind that we read of in Roman history was one between three pairs of gladiators, arranged by Marcus and Decius Brutus on the death of their father, in 264 B.C. The fashion rapidly gained ground, especially during the last years of the republic, and as it did so it became customary for magistrates, public officers, and candidates for the popular suffrages to give gratuitous gladiatorial exhibitions to the people. But the emperors exceeded all others in the extent and magnificence of these spectacles. Julius Cæsar gave a show at which 320 couples fought; Titus gave an exhibition of gladiators, wild beasts, and sea-fights which lasted 100 days; Trajan one of 123 days, in which 10,000 men fought with each other or with wild beasts for the amusement of the Romans; and the taste for these cruel spectacles spread through every part of the extensive Roman empire. Even under the republic efforts had been made to limit the number of gladiators, and to diminish the frequency of these spectacles. Cicero proposed a law that no man should give one for two years before becoming a candidate for office. The Emperor Augustus forbade more than two shows in a year, or that one should be given by a man worth less than half a million sesterces. Constantine in 325 prohibited gladiatorial contests altogether; but their final abolition was due to the splendid daring of Telemachus, an Asiatic monk, who in 404 journeyed to Rome, and there, rushing into the arena, strove to part two gladiators. The spectators stoned him to death, but the Emperor Honorius proclaimed him a martyr, and issued an edict suppressing such exhibitions. The gladiators were for the most part, and always at first, prisoners taken in war and slaves, with the worst classes of criminals. But in the times of the emperors freemen and men of broken fortunes began to enter the profession; and later on knights and senators fought in the arena, and even women. The Emperor Commodus was particularly proud of his skill and prowess as a gladiator. The successful combatant was at first rewarded with a palm branch, but in later years it became the custom to add to this several rich and valuable presents and a substantial prize of money. He was in fact the hero of the hour, like the *espada* of the Spanish bull-ring. It used to be commonly understood that, after a gladiator had been thrown down or disarmed, if the spectators turned up their thumbs, they wish the vanquished man's life to be spared, and, if they turned them down, that he was to be slain. So it is interpreted in Gérome's famous picture. But this is certainly erroneous. The question mainly turns on the interpretation of *vertere pollicem* and *premere pollicem*. Mayor takes the first phrase to mean 'to turn the thumb towards the breast, as the signal for stabbing;' the latter, 'to turn downwards, as the signal for dropping the sword.' Wilkins takes *premere* as closing the thumb on the hand; and *infestus pollex*, the signal for death, seems to have been an upturned thumb. Gladiators were trained in special schools; and it was regarded as a legitimate business to keep them and let them out on hire. The revolt of Spartacus (q.v.), the gladiator, and his companions forms an exciting episode in Roman history. Gladiators were known by different names according to the arms, offensive and defensive, that they wore. Thus, the *Samnites* carried a shield, helmet, greave, some kind of defensive armour on the chest, and a short sword; the *retiarii* carried a trident and a net to entangle their opponents; the *laquearii* had a noose or lasso.

Gladiolus Ramosus.

Gladi'olus, a genus of Iridaceæ (q.v.), with beautiful spikes of flowers, sword-shaped leaves (whence the name—dim. of Lat. *gladius*, 'a sword'), and corms or bulbous rhizomes. Several species are European (*G. palustres*, *communis*, &c.), though none are British; the majority, however, are from the Cape. They are propagated by offset corms or from seed: in this way innumerable hybrids have been produced. The hardy European forms are well adapted to the mixed border, wild garden or shrubbery in dry and sunny situations. Among the leading Cape forms are *G. cardinalis* (red), *psittacinus* (yellow with purple spots), *floribundus* (purple and white), &c., and these have given rise to numerous hybrids—e.g. the first two to *G. gandavensis*, which again stands at the head of many new series of hybrids and varieties. The

scarlet *G. brachyleucus* is similarly a standard form. The corm of *G. communis* was formerly officinal: and the Hottentots dig up some of the Cape species for the sake of their starchy corms. See Nicholson's *Dictionary of Gardening*; Robinson's *Flower-garden*, &c

Gladstone, WILLIAM EWART, statesman, orator, and author, was born in Rodney Street, Liverpool, on the 29th December 1809. He was the fourth son of Sir John Gladstone (1764–1851), a well known and it might almost be said a famous Liverpool merchant, who sat for some years in parliament, and was a devoted friend and supporter of George Canning. Mr Gladstone was of Scotch descent on both sides, and declared more than once in a public speech that the blood that ran in his veins was exclusively Scottish. He was educated at Eton and at Christ Church, Oxford. He became a student at Oxford in 1829, and graduated as a double first-class in 1831. He had distinguished himself greatly as a speaker in the Oxford Union Debating Society, and had before that time written much in *The Eton Miscellany*, which indeed he helped to found. He appears to have begun his career as a strong opponent of all advanced measures of political reform. In the Oxford Union he proposed a vote of censure on the government of Lord Grey for introducing the great Reform Bill which was carried in 1832, and on the Duke of Wellington because of his having yielded to the claims for Catholic emancipation. He also opposed a motion in favour of immediate emancipation of the slaves in our West Indian islands. He soon became known as a young man of promise, who would be able to render good service to the Conservative party in the great struggle which seemed likely to be forced upon them—a struggle, as many thought, for their very existence. It was a time of intense political emotion. Passion and panic alike prevailed. The first great 'leap in the dark' had been taken; the Reform Bill was carried; the sceptre of power had passed away from the aristocracy and the privileged ranks to the middle and lower middle classes. The Conservative party were looking eagerly out for young men of promise to stiffen their ranks in the new parliament—the first elected under the Reform Bill, the first which the middle-class had their due share in creating; the first in which such cities as Manchester and Liverpool and Birmingham were allowed to have representation.

Mr Gladstone was invited to contest the burgh of Newark in the Conservative interest, and he had the support of the great Newcastle family. He stood for Newark, and he was elected. He delivered his maiden speech on a subject connected with the great movement for the emancipation of the West Indian slaves; but he seems to have confined himself mainly to a defence of the manner in which his father's estates were managed, the course of the debate having brought out some charge against the management of the elder Gladstone's possessions in one of the West Indian islands. The new orator appears to have made a decided impression on the House of Commons. His manner, his voice, his diction, his fluency were alike the subject of praise. Mr Gladstone evidently continued to impress the House of Commons with a sense of his great parliamentary capacity. We get at this fact rather obliquely; for we do not hear of his creating any great sensation in debate; and to this day some very old members of the House insist that for a long time he was generally regarded as merely a fluent speaker, who talked like one reading from a book. But on the other hand we find that he is described by Macaulay in 1839 as 'the rising hope' of the 'stern and unbending Tories,' and the whole tone of Macaulay's essay—a criticism of Gladstone's first serious attempt at authorship, his book on the relations between church and state—shows that the critic treats the author as a young man of undoubted mark and position in the House of Commons.

In December 1834 Sir Robert Peel appointed Gladstone to the office of a Junior Lord of the Treasury. In the next year Peel, who was quick to appreciate the great abilities and the sound commercial knowledge of his new recruit, gave to him the more important post of Under-secretary for the Colonies. Gladstone looked up to Peel with intense admiration. There was much to draw the two men together. Knowledge of finance, thorough understanding and firm grasp of the principles on which a nation's business must be conducted—perhaps it may be added a common origin in the middle-class—these points of resemblance might well have become points of attraction. But there were other and still higher sympathies to bring them close. The elder and the younger man were alike earnest, profoundly earnest; filled with conscience in every movement of their political and private lives; a good deal too earnest and serious perhaps for most of the parliamentary colleagues by whom they were surrounded. Mr Gladstone always remained devoted to Peel, and knew him perhaps more thoroughly and intimately than any other man was privileged to do. Peel went out of office very soon after he had made Mr Gladstone Under-secretary for the Colonies. Lord John Russell had brought forward a series of motions on the ominous subject of the Irish Church, and Peel was defeated, and resigned. It is almost needless to say that Gladstone went with him. Peel came back again to office in 1841, on the fall of the Melbourne administration, and Mr Gladstone became Vice-president of the Board of Trade and Master of the Mint, and was at the same time sworn in a member of the Privy-council. In 1843 he became President of the Board of Trade. Early in 1845 he resigned his office because he could not approve of the policy of the government with regard to the Maynooth grant.

The great struggle on the question of the repeal of the Corn Laws was now coming on. It would be impossible that a man with Mr Gladstone's turn of mind and early training could have continued a protectionist when once he had applied his intellect and his experience to a practical examination of the subject. Once again he went with his leader. Peel saw that there was nothing for it but to accept the principles of the Free-trade party, who had been bearing the fiery cross of their peaceful and noble agitation all through the country, and were gathering adherents wherever they went. It is utterly unfair to say that Peel merely yielded to the demands of an agitation which was growing too strong for him. The more generous and the more truthful interpretation of his conduct is that the agitation first compelled him to give his attention to the whole subject; and that as he thought it out he became converted and convinced. When the agitation began, and for long after, Lord John Russell and the Whigs generally were no whit more inclined to free trade than Sir Robert Peel and Mr Gladstone.

It is a somewhat curious fact that Mr Gladstone was not in the House of Commons during the eventful session when the great battle of free trade was fought and won. In thorough sympathy with Peel, he had joined the government again as Colonial Secretary. Knowing that he could no longer be in political sympathy with the Duke of Newcastle, whose influence had obtained for him the representation of Newark, he had given up his seat, and did not come into parliament again until the struggle was over. At the general elections in

1847 Mr Gladstone, still accepted as a Tory, was chosen one of the representatives for the university of Oxford.

Up to the time of the abolition of the Corn Laws, or at least of the movement which led to their abolition, Mr Gladstone had been a Tory of a rather old-fashioned school. The corn-law agitation probably first set him thinking over the possible defects of our social and legislative system, and showed him the necessity for reform at least in one direction. The interests of religion itself at one time seemed to him to be bound up with the principles of the Tory party; and no doubt there was a period of his career when the principle of Protection would have seemed to him as sacred as any other part of the creed. With a mind like his, inquiry once started must go on. There was always something impetuous in the workings of his intellect, as well as the rush of his sympathy. He startled Europe, and indeed the whole civilised world, by the terrible and only too truthful description which he gave in 1851 of the condition of the prisons of Naples, under the king who was known by the nickname of 'Bomba,' and the cruelties which were inflicted on political prisoners in particular. Again and again in Mr Gladstone's public life we shall see him carried away by the same generous and passionate emotion on behalf of the victims of despotic cruelty in any part of the world. Burke himself could not be more sympathetic, more earnest, or more strong.

By the death of Sir Robert Peel in 1850 Mr Gladstone had lost a trusted leader and a dear friend. But the loss of his leader had brought Gladstone himself more directly to the front. It was not until after Peel's death that he compelled the House of Commons and the country to recognise in him a supreme master of parliamentary debate. The first really great speech made by Mr Gladstone in parliament—the first speech which could fairly challenge comparison with any of the finest speeches of a past day—was made in the debate on Mr Disraeli's budget in the winter of 1852, the first session of the new parliament. Mr Disraeli knew well that his government was doomed to fall. He knew that it could not survive that debate. It was always one of Mr Disraeli's peculiarities that he could fight most brilliantly when he knew that his cause was already lost. That which would have disheartened and disarmed other men seemed only to animate him with all Macbeth's wild courage of despair. Never did his gift of satire, of invective, and of epithet show to more splendid effect than in the speech with which he closed his part of the debate and mercilessly assailed his opponents. Mr Disraeli sat down at two o'clock in the morning, and then Mr Gladstone rose to reply to him. Most men in the house, even on the Opposition side, were filled with the belief that it would be impossible to make any real impression on the house after such a speech as that of Mr Disraeli. Long before Mr Gladstone had concluded every one admitted that the effect of Mr Disraeli's speech had been outdone and outshone. From that hour Mr Gladstone was recognised as one of the great historic orators of the English parliament—a man to rank with Bolingbroke and Chatham and Pitt and Fox. With that speech began the long parliamentary duel between these two great masters of debate, Mr Gladstone and Mr Disraeli, which was carried on for four-and-twenty years.

On the fall of the short-lived Tory administration Lord Aberdeen came into office. He formed the famous Coalition Ministry. Lord Palmerston took what most people would have thought the uncongenial office of Home Secretary. Lord John Russell became Secretary for Foreign Affairs. Mr Gladstone, who with others of the 'Peelites,' as they were called, had joined the new administration, was Chancellor of the Exchequer. His speech on the introduction of his first budget was waited for with great expectation; but it distanced all expectation. It occupied several hours in delivery, but none of those who listened to it would have wished it to be shortened by a sentence. It may be questioned whether even the younger Pitt, with all his magic of voice and style and phrase, could lend such charm to each successive budget as Mr Gladstone was able to do. A budget speech from Mr Gladstone came to be expected with the same kind of keen artistic longing as waits the first performance of a new opera by some great composer. A budget speech by Mr Gladstone was a triumph in the realm of the fine arts.

The Crimean war broke up the Coalition Ministry. A motion by Mr Roebuck for inquiry into the condition of the army before Sebastopol was carried by a large majority against the government. Lord Aberdeen at once resigned. Lord Derby was sent for by the Queen, but he could not see his way to form a cabinet without Lord Palmerston, and Lord Palmerston would not go with him. Lord John Russell was summoned, but did not believe he could succeed. In fact, Lord Palmerston was the one indispensable man, and he became prime-minister. Mr Gladstone held his former office for a short time; but when Lord Palmerston gave way to the demand for the appointment of the committee of inquiry, Mr Gladstone believed that as he had conscientiously opposed the appointment of such a committee, he ought not to remain a member of a cabinet which was willing to accept it. His conviction was shared by his Peelite colleagues, Sir James Graham and Mr Sidney Herbert, and they too retired from office. Mr Gladstone gave the government of Lord Palmerston a general support, until, after the attempt of Orsini on the life of the Emperor Napoleon III. in 1858, Palmerston introduced his ill-fated Conspiracy to Murder Bill. Mr Gladstone strongly supported the amendment to the motion for the second reading, which declared that before introducing any proposal for an alteration in the law of conspiracy the government ought to have replied to the French despatch, which virtually accused England of lending her protection to foreign assassins. The government was defeated, Lord Palmerston resigned, and Lord Derby was called on to form a new ministry.

The short stay of the Conservative party in office gave to Mr Gladstone an opportunity of accepting a mission which must have been very much after his own heart. This was the famous visit to the Ionian Islands (q.v.) in 1858.

The year 1859 saw Lord Palmerston back again in office and Mr Gladstone in his old place as Chancellor of the Exchequer. The budget of 1860 was remarkable, as it contained the provisions for the reduction of the wine-duties and the whole simplified system of taxation intended to apply to the commercial treaty which Mr Cobden had succeeded in persuading the emperor of the French to accept. Mr Gladstone also introduced a provision for the abolition of the duty on paper—a duty which was simply a tax upon reading, a tax upon popular education. The House of Lords struck out this clause; a somewhat impassioned popular agitation followed; and in the next session the Lords passed the measure for the repeal of the duty without offering any further opposition. The death of Lord Palmerston in 1865 called Lord Russell to the position of prime-minister and made Mr Gladstone leader of the House of Commons. Mr Gladstone's mind had long been turning in the direction of an extension or rather expansion of the

suffrage. It was assumed by every one that, Lord Russell and Mr Gladstone being now at the head of affairs, a reform bill would be sure to come. It did come; a very moderate and cautious bill, enlarging the area of the franchise in boroughs and counties. The Conservative party opposed it, and were supported in their opposition by a considerable section of the Liberals, who thought the measure was going too far on the road to universal suffrage and the rule of the democracy. The bill was defeated, and the Liberal statesmen went out of office (1866). Mr Gladstone had carried his point, however, for when Mr Disraeli came into office he saw that a reform bill was inevitable, and he prepared his party, or most of them, for the course which would have to be taken. In the very next session Mr Disraeli introduced a Reform Bill of his own, which was enlarged and expanded until it became practically a measure of household suffrage for cities and boroughs.

Somewhere about this time the attention of Mr Gladstone began to be attracted to the condition of Ireland. The distressed and distracted state of Ireland, the unceasing popular agitation and discontent, the Fenian insurrection, brought under England's very eyes by the scheme for an attack on Chester Castle—all these evidences of malady in Ireland's system led Mr Gladstone to the conviction that the time had come when statesmanship must seek through parliament for some process of remedy. Mr Gladstone came after a while to the conclusion that the Protestant state church in Ireland must be disestablished and disendowed, that the Irish land tenure system must be reformed, and that better provision must be made for the higher education of the Catholics of Ireland. He made short work with the Irish state church. He defeated the government on a series of resolutions foreshadowing his policy; the government appealed to the country; the Liberals returned to power, and Mr Gladstone became prime-minister (1868). In his first session of government he disestablished and disendowed the state church in Ireland. In the next session he passed a measure which for the first time recognised the right of the Irish tenant to the value of the improvements he had himself made at his own cost and labour. Never probably was there such a period of energetic reform in almost every direction as that which set in when Mr Gladstone became prime-minister. For the first time in English history a system of national education was established. The Ballot Act was passed for the protection of voters. The system of purchase in the army was abolished—by something, it must be owned, a little in the nature of a *coup d'état*. Then Mr Gladstone introduced a measure to improve the condition of university education in Ireland. This bill was intended almost altogether for the benefit of Irish Catholics; but it did not go far enough to satisfy the demands of the Catholics, and in some of its provisions was declared incompatible with the principles of their church. The Catholic members of the House of Commons voted against it, and with that help the Conservatives were able to throw out the bill (1873). Mr Gladstone tendered his resignation of office. But Mr Disraeli declined just then to undertake any responsibility, and Mr Gladstone had to remain at the head of affairs. The great wave of reforming energy had, however, subsided in the country. The period of reaction had come. The by-elections began to tell against the Liberals. Mr Gladstone suddenly dissolved parliament and appealed to the country, and the answer to his appeal was the election of a Conservative majority. Mr Disraeli came back to power, and Mr Gladstone retired from the leadership of the House of Commons (1874).

For a while Mr Gladstone occupied himself in literary and historical studies, and he published essays and pamphlets. But even in his literary studies Mr Gladstone would appear to have always kept glancing at the House of Commons, as Charles V. in his monastery kept his eyes on the world of politics outside. The atrocious conduct of the Turkish officials in Bulgaria aroused his generous anger, and he flung down his books and rushed out from his study to preach a crusade against the Ottoman power in Europe. The waters rose and lifted him, whether he would or no, into power. The parliament which had gone on from the spring of 1874 was dissolved in the spring of 1880, and the Liberals came in with an overwhelming majority. The period of reaction had gone. Mr Gladstone, now after the famous Midlothian campaigns M.P. for the county of Edinburgh, had to become prime-minister once more. His name was the only name that had come out of the voting urns.

It was an unpropitious hour at which to return to office. There were troubles in Egypt; there was impending war in the Soudan and in South Africa. There was something very like an agrarian revolution going on in Ireland; and the Home Rule party in the House of Commons was under new, resolute, and uncompromising leadership. Mr Gladstone succeeded, nevertheless, in carrying what might be called a vast scheme of parliamentary reform, a scheme which established something very near to universal suffrage, arranged the constituencies into proportionate divisions, extinguished several small boroughs, leaving their electors to vote in their county division, and in general completed the work begun in 1832, and carried further in 1867. It is to the credit of the Conservative party that after a while they co-operated cordially with Mr Gladstone in his reforming work of 1885. This was a triumph for Mr Gladstone of an entirely satisfactory character; but he had sore trials to counterbalance it. He found himself drawn into a series of wars in North and South Africa; and he whose generous sympathy had of late been so much given to Ireland, and who had introduced and carried another land bill for Ireland, found that in endeavouring to pass the measures of coercion which the authorities in Dublin Castle deemed advisable, he had to encounter the fiercest opposition from the Irish members of parliament and the vast bulk of the Irish population. That time must have been for a man of Mr Gladstone's nature a time of darkness and of pain. Lord Frederick Cavendish and Mr Burke were assassinated in Dublin; General Gordon perished at Khartoum. In the end the Irish members coalesced with the Conservatives in a vote on a clause in the budget, and Mr Gladstone's government was defeated. Lord Salisbury came back into office, but not just then into power. His was a most precarious position, depending on the course which might be taken by the Irish members. He was out of office in a few months, and then the general elections came on. These elections were to give the first opportunity to the newly-made voters under Mr Gladstone's latest reform act; and these voters sent him back into office and apparently into power once again.

The use Mr Gladstone made of office and of power astonished his enemies, and startled and shocked not a few of his friends. His government had had in the years between 1881 and 1884 to fight a fierce battle against the policy of obstruction organised by Mr Parnell, the leader of the Home Rule party. The obstruction was organised to prevent or delay the passing of coercion measures, and to force the attention of the British public to the claims of Ireland. The struggles that were carried on will be always memorable in the history of parliament. The fiercest passions were aroused on both sides,

and at one time Ireland seemed to have come to regard Mr Gladstone as her worst enemy. Many a statesman in his place might have allowed himself to be governed by a feeling of disappointment and resentment. But when the elections under the new and extended Reform Bill were held, and the Irish Nationalist party came back 87 members out of the whole Irish representation of 103, Mr Gladstone made up his mind that the voice of the Irish people was in favour of Home Rule, and he resolved to stake power and popularity on an acceptance of their demand. In March 1886 he brought in a measure to give a statutory parliament to Ireland. A sudden and serious split took place in his party; some of his most influential colleagues declared against him; the bill was rejected on the second reading, and Mr Gladstone appealed to the country, only to be defeated at the general election. The Conservative party, with the help of the Liberals who had declined to follow Mr Gladstone, came back into power with a strong majority, Mr Gladstone leading the Opposition. At the general election of 1892 his party, including both sections of Irish Nationalists, secured a majority of above forty over the combined Conservatives and Liberal Unionists. In 1893 his Home Rule Bill was carried in the House of Commons in spite of the strenuous opposition of the combined Unionist sections, but was thrown out in the House of Lords. Owing to the increasing infirmities of age, especially impaired eyesight, the veteran statesman resigned 3d March 1894, and was succeeded by Lord Rosebery. He still took an interest in public affairs and busied himself with literary work—in January 1898 he published his reminiscences of Arthur Hallam; but falling seriously ill, after some months of suffering borne with noble fortitude, he died at Hawarden on the 19th May 1898. He was buried in Westminster Abbey.

Mr Gladstone's contributions to literature, ranging from political pamphlets to Homeric studies (including the article HOMER in this volume) and theological treatises, would have made another man's reputation; but to the world they are interesting chiefly as illustrating a marvellous and unresting mental activity. Probably no other English minister has left behind him so long and so successful a record of practical legislation; some of the best legislation accomplished by his political opponents was his own work taken out of his hands. As a parliamentary debater he never had a superior—it is doubtful whether he ever had an equal—in the whole of the political history of these countries. There have been even in our own time orators who now and then shot their arrows higher; but so ready, so skilful, and so unerring an archer as he, taken all round, never drew bow on modern parliamentary battle-ground. Nature had given him an exquisite voice—sweet, powerful, easily-penetrating, capable of filling without effort any public building however large—vibrating to every emotion. The incessant training of the House of Commons turned nature's gifts to their fullest account. He was almost too fluent; his eloquence sometimes carried him away on its impassioned tide; but his listeners were seldom inclined to find fault with this magnificent exuberance. We should be inclined to rank him as one of the greatest orators, and the very greatest debater, of the House of Commons.

Among Mr Gladstone's works are *The State in its Relations with the Church* (1838); *A Manual of Prayers from the Liturgy* (1845); *Two Letters on the State Prosecutions of the Neapolitan Government* (1851); *Studies on Homer and the Homeric Age* (3 vols. 1858); *A Chapter of Autobiography* (1868); *Jurisdictus Mundi* (1869); *The Vatican Decrees, bearing on Civil Allegiance* (1874); *Vaticanism* (1875); *Homeric Synchronism* (1876); *Gleanings of Past Years* (7 vols. 1879); *The Irish Question* (1886); a translation of Horace (1894); an edition of the Psalter with a Concordance (1895); and a monumental edition of Butler's works (3 vols. 1896). There are Lives by J. McGilchrist (1868), Barnett Smith (1879), Thomas Archer (1883), G. W. E. Russell (1891), Leech (compiled from letters and speeches, 1894), Lucy (1895), Robbins (1895), the present writer (1894 and again in 1898), Sir E. Hamilton (1898), Sir Wemyss Reid (1899). In 1900 Mr John Morley was engaged on the official life.

Glagolitic Alphabet, the ancient Slavonic alphabet (see ALPHABET), older than the Cyrillic alphabet (see CYRIL) by which it was superseded. Both were derived from the Greek minuscules.

Glairine, another name for Baregine (q.v.).

Glaisher, JAMES, meteorologist, was born in London in 1809. When twenty years of age he began to make meteorological observations as an officer of the Ordnance Survey of Ireland. For three years from 1833 he was employed in the observatory at Cambridge, and in 1836 removed to Greenwich, where four years later he became superintendent of the magnetical and meteorological department of the Royal Observatory, a post which he held for thirty-four years. Since 1841 he has prepared the annual and quarterly meteorological reports issued by the registrar-general. Between 1862 and 1866 he made twenty-eight balloon ascents for the purpose of studying the higher strata of the atmosphere, on one occasion reaching a height of over 7 miles (see *Brit. Assoc. Rep.*, 1862–66, and BALLOON). Mr Glaisher was the founder of the Royal Meteorological Society, and became a Fellow of the Royal Society in 1849. He has written numerous works and papers on subjects relating to astronomy and meteorology. In 1879–83 he published a complement to Burckhardt and Dace's *Factor Tables*.

Glamorganshire (in Welsh, *Gwlad Morgan*), the most southerly of the counties of Wales, is bounded S. and SW. by the Bristol Channel, NW. by Caermarthen, N. by Brecknock, and E. by Monmouth. Area, 855 sq. m.; pop. (1801) 70,879; (1841) 171,188; (1871) 397,859; (1881) 511,433; (1891) 687,147. This increase, which is unexampled in the kingdom, has been brought about by the development of the coal and iron industries. In the western portion of the county the coast is indented by Swansea Bay, from which it projects westward into the peninsula of Gower. The northern district is covered with rugged hills, the highest of which, however, Llangeinor, is only 1859 feet in height. This district comprises one of the richest coalfields in the kingdom. The southern portion of the county consists of a series of fertile valleys, richly wooded and with a mild climate, the finest being the Vale of Glamorgan, the 'garden of Wales.' The soil is a deep rich loam resting on limestone, and is excellently adapted for the growth of cereals. The mountainous district is intersected by numerous picturesque valleys, affording good pasturage for sheep and cattle. The chief rivers—the Rhymney, Taff, Neath, Tawe, and Llwchwr—flow southward into the Bristol Channel. Besides coal, anthracite or stone-coal, coking-coal, ironstone, and limestone are found. At Merthyr-Tydvil and Dowlais are large ironworks; at Swansea, Neath, Aberavon, large copper-smelting works. Tin and lead are also smelted in the county. Wheat, barley, oats, and potatoes are the chief crops raised; and butter and cheese are largely produced. The farms are generally small, and agriculture is not in a highly advanced state. The county sends five members to parliament; the represented boroughs are Merthyr-Tydvil (with two), Swansea town (two), and the Cardiff boroughs (one). Glamorganshire contains some interesting Roman remains,

and many ruined memorials of the middle ages. Of these last Oystermouth Castle, Caerphilly Castle, and Castle Coch are the finest specimens. Cardiff Castle is a fine restored edifice. See Thomas Nicholas, *History of Glamorganshire* (1874).

Glance (Ger. *Glanz*), a term often applied in popular language, and also by mineralogists, to a numerous order or family of minerals, of which Galena (q.v.) or *Lead glance* may be regarded as a type. All of them are metallic, and many of them are known by names indicating the metal which is their principal constituent, as *Lead glance*, *Silver glance*, *Bismuth glance*, &c. In these and many other species the metal is combined with sulphur, so that the mineral is a sulphuret; but there are also numerous species of glance in which sulphur is not present, but selenium, arsenic, or tellurium takes its place. In some kinds, also, two or more metals are present instead of one, in combination with one or other of these non-metallic or semi-metallic substances. Thus, *Gold-glance*, or *Sylvanite*, consists of gold and silver in combination with tellurium; it occurs in veins in porphyry, in Transylvania, and is wrought for the sake of both the precious metals which it contains. Several kinds of glance are very valuable ores, as *Lead-glance* or *Galena*, *Copper-glance* or *Redruthite*, and *Silver-glance* or *Argentite*. Although some mineralogists have adopted the names *Pyrites*, *Glance*, and *Blende* as names of orders or families, the limits and distinctions of these groups are not well marked. All kinds of glance are fused without much difficulty by the blowpipe. They are also soluble in acids.

Glance-coal. See ANTHRACITE, and COAL.

Glanders, or EQUINA, a malignant, contagious, and fatal disease of the horse and ass, due to the introduction into the body, or perhaps to development within it, of a virulent organism called the *Bacillus mallei*. Discovered by Dr Strück of Berlin, and almost identical with the microbe of tuberculosis, this organism is about $\frac{1}{5000}$th of an inch broad, but varies from $\frac{1}{1000}$th to $\frac{1}{250}$th of an inch in length. This microbe, whilst infecting the whole system, shows specific effects more especially upon the mucous membrane of the nose, upon the lungs, and on the lymphatic system. Glanders and its modification Farcy are capable of transmission to man—on whom the virus increases in malignancy—to sheep, goats, dogs, the feline species, and even to mice and rabbits; pigs and fowls resist the contagion, and until lately cattle were thought to do so, but experiments have thrown doubt upon this.

In a typical case of glanders ulcers form in the nose, characterised by ragged and inflamed edges, discharging a viscid or sticky pus; a hard tumour forms under the jaw; the animal usually loses condition very rapidly; farcy buds and ulcers appear on the skin in various regions of the body; the limbs swell; and the animal dies a loathsome object. Any cause which interferes with the purity or integrity of the horse's blood or produces a deteriorated or depraved state of his system predisposes to glanders. It has been frequently developed in healthy animals by their breathing for a short time a close, impure atmosphere, and cases of this sort were thus produced amongst the horses of several cavalry regiments during their transport in badly-constructed, overcrowded vessels to the Crimea in 1854. Confined, overcrowded, badly-ventilated stables are almost equally injurious, for they prevent the perfect aeration of the blood, and the prompt removal of its organic impurities. Bad feeding, hard work, and such reducing diseases as diabetes and influenza also rank amongst the causes of glanders. Government by the Act Vict. 16 and 17, of date 14th August 1853, very properly compels the immediate destruction of every glandered horse. Glanders, like farcy, is dealt with by the Contagious Diseases Acts, 1878-86. Horses frequently have the disease in a chronic form, and if well fed and managed they might sometimes live and work for years in this condition: in the old coaching-days some stages were known to be worked by glandered teams. But no animal with glanderous ulcers or discharge should on any account be preserved; for, besides being perfectly incurable, the fatal disease is communicable not only to healthy horses, but also to human beings. The symptoms of glanders in man are very similar to those in horses, the disease in man being generally regarded as fatal. The only available treatment consists in good nutrition, tonics, disinfectants, and detergent applications. In 1889 one of two Viennese surgeons who had been experimenting with bacilli from a human case of glanders, and artificial cultures from these bacilli, was infected with this disease in its most malignant form, and died.

Glands are secreting structures, the component elements of which in various ways alter the material brought to them by the blood, extracting and excreting waste products as in the kidneys, or manufacturing valuable by-products, such as the glycogen and bile of the liver. In a typical gland three parts have to be distinguished: (*a*) the secreting cells usually enclosed in some more or less distinct membrane; (*b*) the surrounding network of blood-vessels; and (*c*) the duct by which the products of secretion pass from the gland.

Most true glands are pockets of glandular skin, mucous membrane, or epithelium, and occur on the outer surface of the body, as in the sweat-glands of the skin; on the lining of the alimentary canal—e.g. salivary glands, liver, pancreas, intestinal glands, &c.; or on other internal surfaces—e.g. in connection with the genital ducts. They may be classified according to their origin from (1) the ectoderm or epiblast, (2) the mesoderm or mesoblast, and (3) the endoderm or hypoblast. Thus, (1) in connection with the outer skin there are, besides glandular cells (so-called unicellular glands), numerous secretory pockets, such as the sweat, scent, anal, poison, adhesive, byssus, slime, spinning, and mammary glands. At each end of the (endodermic) gut there is a more or less prolonged invagination of ectoderm, and the glands connected therewith are obviously in the above embryological category. (2) The kidneys of most animals illustrate glands of mesodermic origin, but

Diagram of Glands (from Hertwig):
a, simple tubular gland; *b*, branched tubular glands; *c*, simple racemose glands; *d*, branched racemose gland; *e*, duct of gland; *f*, sac of gland.

it is inaccurate to speak of the reproductive organs (as is often done) as glands. They liberate reproductive cells, differentiated elements, not products of secretion. (3) The numerous glands

connected with the main part of the alimentary canal are of endodermic origin.

The structure of secretory pouches varies greatly, and, as the accompanying diagram suggests, glands may be classified according to their morphological complexity, as tubular, saccular, lobed, much branched or racemose, &c. The more complex glands—e.g. liver or kidney—will be discussed under their proper headings. In all simple glands the pouch is at first a mere sac; but as the epithelium increases greatly, and yet is more or less circumscribed in its expansion, lobing and branching naturally result.

A third classification of glands is possible—viz. according to their functions—excretory or secretory, lubricatory or digestive, and so on. The various functions of the different glands will be discussed under separate headings; see the articles Circulation, Digestion, Kidneys, Liver, Pancreas, Reproduction, Saliva, Secretion, Spleen, &c.

Many structures are often called glands, which are so far removed either in structure or in function or in both from those above mentioned that the term is misleading. Such are the reproductive organs, the 'pineal gland,' the spleen, the thyroid and thymus 'glands,' the 'lymphatic glands,' the supra-renal capsules, and so on.

Diseases of the Glands. The 'lymphatic glands' are subject to enlargement from acute inflammation and abscess, usually in consequence of irritation of the part from which their lymphatics spring, as in the case of scarlet fever (in which the glands of the throat are affected), in gonorrhea (the glands of the groin), &c. The treatment of such abscesses belongs to the ordinary principles of surgery (see Abscess, Adenitis). A much more troublesome affection of the glands is the slow, comparatively painless, at first dense solid swelling which they undergo in Scrofula (q.v.), which tends very slowly, if at all, to suppuration, and sometimes remains for years. In Syphilis (q.v.) and Cancer (q.v.) there are also enlargements of the lymphatic glands. Scrofulous or tubercular disease of the mesenteric glands in children constitutes Tabes mesenterica (see Mesentery). The larger glands, as the liver, kidney, pancreas, spleen, thyroid, thymus, testicle, have all their special diseases, which will be noticed, so far as necessary, in treating of these organs.

Glanvill, Joseph, was born at Plymouth in 1636, entered Exeter College, Oxford, in 1652, and took his degree in due course, residing afterwards at Lincoln College. The dominant Aristotelianism of Oxford weighed on him almost as heavily as the prevailing Puritan dogmatism of the outer world—he would have breathed more freely in the air of Cambridge, and so have reached the 'new philosophy' of Descartes by a much shorter route. After the Restoration, Wood tells us that he 'turned about and became a Latitudinarian.' He took orders, and was appointed in 1662 to the vicarage of Frome in Somerset, which he exchanged in 1672 for the rectory of Street in the same county. Already in 1666 he had become rector of the Abbey Church in Bath, and in 1678 he was installed prebendary of Worcester. He died of fever in 1680, and was buried in the north aisle of the Abbey Church at Bath. Glanvill early succeeded in shaking himself free from religious and scientific dogmatism, and his famous work, *The Vanity of Dogmatizing, or Confidence in Opinions* (1661), was a noble appeal for freethought and experimental science. In its second issue (1665) it took the new title of *Scepsis Scientifica, or Confest Ignorance the Way to Science*, prefaced by a warm panegyric on the newly-founded Royal Society, of which he had become a fellow the year before (new ed., with introductory essay by John Owen, 1885). A strong sense of the infirmity of human reason was a fundamental axiom in Glanvill's thought; and a striking corollary to this was his credulity as to witchcraft, seen in his *Philosophical Considerations touching the Being of Witches and Witchcraft* (1666), and in later books suggested by the doings of the invisible drummer at Mr Mompesson's house at Tedworth, Wiltshire, in 1663. His notions on this subject are seen further in the posthumous *Sadducismus Triumphatus, or a Full and Plain Evidence concerning Witches and Apparitions* (1681). The book is inductive in the form of its argument, the proof being based on a collection of modern relations, but of course it is based upon a fundamental misconception of the nature of human testimony. Glanvill maintained that Atheism was begun in Sadducism, and that witches disproved, all spiritual existence vanished with them. His superstition was at least a relief from the gross materialism that was the inevitable reaction from Puritan dogmatism; and, if it was really unphilosophical, it was shared by Boyle, Henry More, Baxter, and Cudworth.

Glanvill, Ranulf de, chief-justiciary of England in the reign of Henry II., and author of the earliest treatise on the laws of England, the *Tractatus de Legibus et Consuetudinibus Angliæ*, which was composed about the year 1181. It treats of the forms of procedure in use in the *Aula Regis* or King's Court, over which he presided, and consists of fourteen books. It was first printed in the year 1554; and the best edition, with a translation, of it is that by Sir Travers Twiss (Record Publication, 1892). The treatise closely resembles the Scottish *Regiam Majestatem*, which, however, it is now generally agreed, is of later date than the *Tractatus*. Glanvill was born at Stratford in Suffolk, but in what year is not known; in 1175 he raised a body of knights to fight against William the Lion of Scotland, and in 1180 became justiciary of all England. Being removed from this office by Richard I. on his accession, Glanvill took the cross, and died at the siege of Acre (1190).

Glanville, Bartholomeus de. See Encyclopedia.

Glapthorne, Henry, a minor dramatist in the period of decadence that followed the Elizabethan, of whose life nothing whatever is known save that he flourished between the years 1639 and 1643, was a friend of Cotton and Lovelace, wrote a few fair poems and five plays—*Albertus Wallenstein*, a tragedy; *Argalus and Parthenia*, a poetical dramatisation of part of the *Arcadia*; two comedies, *The Hollander* and *Wit in a Constable*; and *Love's Privilege*, a tragico-comedy. Mr Bullen, on dubious internal evidence, attributes to him also *The Lady Mother*. Glapthorne's dramatic faculty is but feeble, and it was hardly a kindness to his memory to reprint his works (2 vols. 1874), which long encumbered the book-stalls. Nor was it wise of his anonymous editor to try to eke out our slender knowledge of his life by irrelevant and unedifying details about one George Glapthorne of Whittlesea, who need not even have been a relative.

Glarus, a canton of Switzerland, bounded by the cantons of St Gall, the Grisons, Uri, and Schwyz, with an area of 266½ sq. m., and (1888) 33,825 inhabitants, of whom four-fifths belong to the Reformed Church. It is an Alpine region, trenched by the valley of the Linth or Limmat and its lateral vales, and rising in its south-western corner, in the Todi peak, to an altitude of 11,887 feet. The climate is very severe, and only one-fifth of the land is arable. The rearing of cattle and the manufacture of cotton and woollen goods are the chief

occupations of the people. The green cheese called Schabziger is wholly made here, and it and other agricultural products are exported. The constitution is drawn on broad democratic lines. Full freedom of the press, of religion, of industry, and of trade prevails. The capital of the canton is the town of Glarus (5330 inhabitants in 1880), 43 miles SE. of Zurich by rail. It was founded by an Irish monk, Fridolin, in the end of the 5th century. Zwingli was pastor here from 1506 to 1516. Glarus, having been peopled by German settlers, passed after various changes into the possession of the dukes of Austria, but ultimately secured its independence by the victories of Näfels in 1352 and 1388. In 1450 it joined the Swiss Confederation.

Glas, John. See Glassites.

Glasgow, the industrial metropolis of Scotland and the most populous city in Great Britain next to London, is situated on the banks of the Clyde, in the county of Lanark, the portions heretofore in Renfrew and Dumbarton shires having been transferred to Lanark under the act of 1889; at Greenock, 22 miles below, the river spreads out into a great estuary, the Firth of Clyde. Glasgow is within a nine hours railway journey of London, the distance being 405¼ miles, and is about an hour's run (45 miles) from Edinburgh. The city in extent is about 3¼ miles from north to south, and the extreme length is 5 miles from east to west. In reckoning area and population, however, the ring of burghs which have since the passing of the 'Lindsay' Burgh Act sprung up around and almost hemmed in Glasgow ought to be taken into consideration, as these burghs have been formed by the overflow of the population from the city proper. In 1891 the population within municipal boundaries was 565,714; within suburbs incorporated on 1st November 1891, 91,232; within suburbs not yet incorporated (Govan, Partick, &c.), 113,525—a total of 770,471 in city and suburbs. To this may be added 40,940 persons in business in Glasgow residing beyond the suburbs, and 3000 at the coast at census time, giving a grand total of 814,411. In 1881 the municipal population was 511,415, and, with the nine suburban burghs and the non-burghal suburbs, the total was 692,322; in 1801 the population was only 77,385, so that the increase has been rapid and enormous.

The origin of the name Glasgow is a subject which has been much disputed, and is still at best a mere matter of conjecture. From the position of the original settlement on the banks of the Molendinar, which stream flowed to the Clyde through a dark ravine, it has been argued that the name means 'dark glen.' A more favourite interpretation, however, is based on the fact that a village actually existed on the present site of the city prior to the settlement of Kentigern, and that it was called Cleschu, which name by a series of natural changes in time came to be written Glasghu or Glasgow. This conclusion is probably correct, and admits easily enough of the meaning deduced from it—viz. that in Celtic *Glas* signifies 'green,' and *cu* or *ghu* 'dear,' thus making the combination Glasgow mean the *beloved green spot*.

Glasgow does not occupy an important place in the early history of Scotland. As an archiepiscopal seat, and subsequently as a centre of Covenanting activity, it has a prominence in religious affairs; but as an industrial city its history can hardly be dated further back than the Union of 1707. This event opened up to the town—the most favourably situated in Scotland for the enterprise—an immense trading prospect with America, and roused in its inhabitants the extraordinary mercantile activity which has been its leading feature ever since. And yet the city of Glasgow is a very old one. It was about 560 A.D. that the half-mythical St Kentigern (q.v.) or Mungo established himself on the banks of the Molendinar, and appeared as the apostle of Christianity to the rude Celts of Strathclyde. There he built his little wooden church on the very spot where now rises the venerable cathedral. From this date for five hundred years the history of the settlement by the Clyde is a blank. The church disappeared from history, and if the village which had clustered round it and grown under the fostering care of the clergy still remained, it was a place of no importance. In the year 1115 the Prince of Cumbria, afterwards David I. of Scotland, ordered an investigation to be made into the lands and churches in the bishopric of Glasgow, and from the deed still existing of that date it is evident that a cathedral had been previously endowed. In 1116 the diocese was restored, and when David a few years after became king of Scotland he gave to the see of Glasgow the lands of Partick, besides restoring to it much of the property of which it had been despoiled. In 1124 he also gifted money for the purpose of building a church, which was dedicated in 1136, and afterwards enriched by many royal and private donations. Between 1175 and 1178 Jocelyn, Bishop of Glasgow, received authority from William the Lion to 'have and hold' a burgh in the neighbourhood of the cathedral. Alexander II. supported Glasgow in a conflict of jurisdiction with Rutherglen, and bestowed on it the rights of trade throughout the kingdom. Robert the Bruce confirmed to the bishop the various charters granted to him, and James II. prohibited Renfrew and Rutherglen from exacting toll 'by water or by land' within its territories. In 1450 the city was erected into a regality which gave the bishop the highest jurisdiction the crown could bestow on a subject-superior, and within the same year the university was constituted under a bull of Pope Nicholas V., which was confirmed three years later by a letter of privileges from the king and a charter from the bishop and chapter.

In 1454 reference is made to one John Stewart as the first provost that was in the city of Glasgow. After that date the magistrates are described as provost and bailies; and, though it is not recorded how they were elected at that time, in 1476 James III. authorised the ruling bishop in Glasgow to elect so many bailies, sergeants, and other officers as were needed within the city, and to appoint a provost, all to hold office during his pleasure. This unsatisfactory mode of procedure continued in force till 1587, when the whole of the church lands were annexed to the crown, and several months later granted to Walter, Commendator of Blantyre, in feu for payment to the crown of £500 Scots annually. Along with other privileges, Blantyre and the Duke of Lennox both claimed the right of choosing the provost and bailies of the burgh, which privilege had been taken from the church. James VI. in 1600 conveyed to Lennox that right; but five years later the city itself was authorised to have the freedom of election of its own magistrates, and in 1611 this authority was confirmed by act of parliament—not, however, without the stipulation that both the church and Lennox should reserve the right to influence the election. Glasgow therefore did not fully receive the position of a royal burgh till 1636, when it was incorporated into one free royal burgh, with the freedom of the Clyde from the bridge of Glasgow to the Clochstane in the Firth of Clyde. At the time of the Commonwealth the Glasgow citizens made a strenuous effort to effect the union of England and Scotland; but the death of Cromwell and subsequent restoration of Charles II. delayed it, and materially hindered the active trade between the two countries which the policy of the Protector had

inaugurated. The city in 1656 is described as a 'very neate burghe toun—one of the most considerablest burghs in Scotland, as well for the structure as trade of it;' and the same writer commends the 'mercantile genius of the people.'

As early as 1516 trades in Glasgow were forming into guilds, but it was not till 1672 that the letter of guildry, adjusted in 1605, was confirmed by parliament, which put an end to the perpetual disputes between the merchants' and the trades' guilds. These two classes still exist, the former being represented by the Merchants' House, and the latter by the Trades' House, the heads of which, the dean of guild and the deacon-convener respectively, have been since 1711 constituent members of the town-council. In 1833 all the complicated arrangements in connection with municipal elections were set aside by the Burgh Reform Act, and the number of councillors in Glasgow was fixed at thirty, over and above the dean of guild and the deacon-convener. Since then the number of magistrates and councillors has increased with the increase of the city boundaries. As constituted in 1890, the town-council has forty-eight members elected by the citizens—three for each of the sixteen wards of the city—with the addition of the dean of guild and the deacon-convener of trades. The council elects the Lord Provost, ten bailies, a bailie of the River and Firth of Clyde, and other officers. The city is represented in parliament by seven members for as many different electoral divisions; and the suburban divisions, Govan and Partick, also each return a member.

The corporation of Glasgow, since it became a popularly elected one, has carried through great operations for the improvement of the city. By its various departments, each controlled by committees from the general council, the lighting, cleansing, water-supply, &c. are administered. In connection with the water-supply, the corporation in 1854–59 constructed immense works for a supply of water unequalled in the kingdom, bringing it from Loch Katrine, a distance of 34 miles. The water is conveyed by aqueduct and piping to a reservoir, 70 acres in area, about 7 miles from Glasgow, where it is filtered and distributed by pipes over the city. The average daily distribution now exceeds 40 million gallons. The cost of the construction of these works, including the price paid to the previously existing water companies, has been £2,350,000; and in 1889–96 extensive works were completed at a further expenditure of £1,000,000, for raising the supply of the city to 100 million gallons daily. The valuation of the city in 1855, the first year of the Lands Valuation Act, was £1,362,168; in 1870 it was £2,126,324; and in 1894–95 it reached £4,208,000.

The lighting of the city also forms one of the municipal departments, the corporation having acquired powers to purchase the properties of the two gas companies which formerly supplied Glasgow and its suburbs. At the present time over 2300 million cubic feet of gas per annum is supplied to the public: the capital expenditure on the various works amounted in 1889 to £610,000, and the annual revenue is £390,000. Between 1866 and 1890 the town-council as the City Improvement Trust spent two millions sterling on objects such as are indicated by its title, and at present that body holds property valued at over half a million of money. Of thoroughfares in Glasgow there are about 200 miles, and the Clyde is within the burgh spanned by ten bridges, of which three are railway viaducts and two suspension bridges for foot-passengers. Parliamentary sanction was obtained in 1889 for constructing a tunnel for foot and vehicular traffic under the river at the harbour. Throughout the city there are upwards of 100 miles of main-sewers, the largest—in brick—being 6 feet in diameter, and the smallest 2 feet.

Of buildings possessing historical interest Glasgow is conspicuously destitute, with the very notable exception of the cathedral, which is a fine example of the Early English Gothic style of architecture. It was begun by Bishop Jocelyn about 1197, to replace the church built in 1136 by Bishop John Achaius, which had been destroyed by fire. The structure was largely added to by Bishops Bondington and Lauder, and was practically brought to its present form by Bishop Cameron in 1446. It was saved from injury in the fit of iconoclastic zeal which followed the Reformation by the activity of the Glasgow craftsmen, and afterwards, from time to time, was carefully repaired by the Protestant archbishops who governed the see until the Revolution. The cathedral is in length from east to west 319 feet, and in width 63 feet. It was designed to be in the form of a cross, but the transepts were never erected. From the centre rises a tower, surmounted by a graceful spire, 225 feet in height. The most famous part of the building is the so-called crypt under the choir, which for elaborate designing, and richness of ornamentation on pillars, groining, and doors, stands unrivalled amongst similar structures in Britain. Properly speaking, however, it is not a crypt, but a lower church formed to take advantage of the ground sloping eastward towards the bed of the Molendinar. About 1854, under the direction of the government, the building was repaired and renewed, its general character being scrupulously maintained. At the same time the ancient tower and consistory house on the west face of the cathedral were removed. Since then a series of stained-glass windows has been provided, mostly by Munich artists.

The city chambers opened in 1889, built at a cost of £530,000, form an architectural feature of great importance, and occupy a prominent position, filling the east side of George Square. The Royal Exchange, a handsome building ornamented with colonnades of Corinthian pillars, contains a newsroom 122 feet in length by 60 feet broad. In the building of churches Glasgow has made great strides during the last thirty years, so that probably no other town in the United Kingdom has done more in this respect, and the ecclesiastical buildings of all denominations vie with each other in the elegance of their adornment. The architecture of many of the banks and other public buildings is varied in style and rich in detail, and the post-office buildings, of which the foundation-stone was laid by the Prince of Wales in 1876, though severely plain and massive, deserve mention for their great size and perfect planning. Not without reason, indeed, Glasgow has been called one of the best-built cities of the empire: its streets are well laid out and spacious, and the houses which line them are substantially built of excellent stone which is quarried in abundance around the city.

Glasgow is especially well provided with public parks, having three beautifully planned pleasure-grounds in different districts of the city, besides the Glasgow Green—a wide expanse along the north bank of the river—all of which are maintained by the town-council as a Parks and Galleries Trust. The statues in Glasgow are not numerous, though some of them are very fine. The equestrian statue of Wellington stands opposite the Royal Exchange, and that of William III. at the east end of Argyle Street, near the site of the old cross. The greatest number of monumental statues are in George Square, where in addition to the equestrian statues of the Queen and the late Prince Consort are to be found figures of James Watt, Sir Walter Scott,

Robert Burns, David Livingstone, Sir John Moore, Thomas Campbell, Lord Clyde (the last three natives of the city), and others.

The Glasgow and West of Scotland Technical College was formed in 1886 by the amalgamation of several institutions (including the arts department of Anderson's College, q.v.) under a scheme formulated by the Educational Endowments Commission. It has over 2000 students attending its day and evening classes. It provides suitable education for those who wish to qualify themselves for following any industrial pursuit, and trains teachers for technical schools. St Mungo's College, dating from 1889, has faculties in medicine and law; and the medical department of Anderson's College is a separate school. St Margaret's College is for women. The Free Church College possesses conspicuous buildings; and mention should also be made of the Normal Schools, and of the School of Arts and Haldane's Academy. Of the secondary schools in Glasgow the principal is the High School—a survival of the ancient grammar-school of the city—which is under the management of the school board. Other schools of a like standing are the Glasgow and the Kelvinside academies, both large and efficiently managed; while, richly endowed from the Hutcheson Trust, two schools for boys and girls provide at a very low rate a thoroughly good secondary education. Scattered throughout all the districts of the town are the seventy elementary schools of the Board. Amongst educative agencies may be reckoned the Glasgow Art Gallery and Museum in the Kelvinside Park, being built in 1900 beside the more temporary buildings for the Exhibition in 1901.

Unfortunately, the city is entirely destitute of fine buildings wholly devoted to library purposes. There is no free lending library in the town, but there are several great collections which may be used free of charge as consulting libraries. Of these the Mitchell Library, which is under corporation management, contains over 75,000 volumes; and the Stirling's and Glasgow Public Library contains about 45,000 volumes. Baillie's Library is under the same roof. The university has a library of 175,000 volumes, among which number

Glasgow, from the Broomielaw.

are many notable examples of Caxton's and Pynson's and other 15th century printing; but the library is only available to alumni of the university. The Athenæum includes a newsroom, magazine-room, and a library of 12,000 volumes. Of subscription lending libraries there is an abundance in the city, and private libraries are to be found in such large numbers as to form a distinctive feature. The publishing of books and newspapers has of late been more largely developed. Glasgow has two daily morning newspapers, three evening, and about a dozen weekly newspapers and periodicals, and one or two monthlies. An industrial museum has been instituted in the city in which a considerable collection, especially in the natural history department, is now displayed. It is supported under the Parks and Galleries Trust, as are also the Corporation Galleries of Art, a collection of pictures and statuary acquired partly by purchase, but more largely by donation and bequest. The galleries contain a very valuable series of old Dutch masters, and there is a noble statue of Pitt by Flaxman.

With benevolent and charitable institutions the city is richly endowed. In addition to numerous hospitals and dispensaries for special diseases, there are three general infirmaries, which among them accommodate upwards of one thousand patients. These are the Royal Infirmary in the north-east district, the Western Infirmary adjoining the University, and the Victoria Infirmary in the Queen's Park, South Side. They are all maintained by voluntary contributions and bequests.

Three magnificent terminal railway stations bring traffic to the heart of the town, respectively forming the headquarters of the three great Scotch lines—the Caledonian, the Glasgow and South-Western, and the North British. St Enoch's Station, the terminus of the Glasgow and South-Western, is modelled on the plan of St Pancras; the Central Station is the headquarters of the Caledonian, The Underground Railway (1886), in connection with the North British system, and the City Union line afford every facility for rapid travelling into nearly every quarter of the town; and in 1889–95 there was constructed an underground system connected with the Caledonian Railway, passing through the busiest and most

populous districts. There is also a circular cable-car subway 6½ miles long, with fifteen stations, on both sides of the river. Originating with the corporation authorities, the running of tram-cars—now the property of the town and driven largely by electricity—in Glasgow has proved a great success. Another means of transit is found in the magnificent fleet of river-steamers, which are noted for speed, comfort, and elegance of appointment, and afford a rapid and easy means of access to all the Western Highlands and Islands, thus making Glasgow the metropolis of the West. Two of the foremost of these 'floating palaces' are the *Columba* and the *Lord of the Isles*, the former of which attains a speed of 22 miles an hour, and can accommodate 2000 passengers on its daily journey of 160 miles.

The river Clyde (q.v.) has been a chief source of the great prosperity of Glasgow, and it is to the credit of Glasgow citizens that through their enterprise its utility has almost been created by the gigantic works of narrowing the channel and dredging, so that what within the memory of persons still alive was a stream over which one could wade has now become a channel capable of allowing ships which draw 24 feet of water to ride at anchor. The quayage of the harbour and docks from the Broomielaw extends to over 11,000 lineal yards, and the water space covers 154¾ acres, while since 1875 two graving-docks have been provided capable of accommodating the largest mercantile steamers afloat. On the river and harbour the Clyde Navigation Trust has spent about eleven millions sterling, and the annual revenue usually exceeds £300,000; while the customs revenue of the port amounts to more than £1,500,000. The principal feature of the Clyde beyond the harbour is the great shipbuilding and marine engineering yards which line its sides, and which have flourished since the second quarter of this century. The pioneers of these industries—the Napiers, Charles Randolph, John Elder, &c.—have a world-wide fame. They launched from their yards the most perfect examples of naval architecture and engineering skill of their day, and their successors at the present day amply uphold that reputation by marvels of naval architecture, such as the *City of New York*, *City of Paris*, *Lucania*, and *Campania* (see SHIPBUILDING). The greatest tonnage launched in any year on the Clyde was 419,600 in 1883: the normal output is from 200,000 to 300,000 tons; in 1889–95 the yearly tonnage built was upwards of 300,000 tons. To the success of the little *Comet*, the earliest trading steamship in the Old World, which began to ply between Glasgow and Greenock in 1812, may be traced the great development of shipbuilding and shipping on the Clyde.

But another factor in the industrial prosperity of the city is the fact that it is built over a coalfield rich in seams of ironstone. Glasgow is exceptional in having blast-furnaces actually within its municipal bounds. It was in the neighbourhood of the city that the first experiments with Neilson's hot-blast in iron-furnaces, patented in 1828, were made, and the economy thereby effected developed the iron industry so rapidly in Glasgow as to distance for a long period all competition. Great forges, with powerful steam-hammers and other appliances, the making of steam-tubes, boiler-making, locomotive-engine building, sugar machinery, and general engineering are among the most important industrial features of the city.

Bleaching and calico-printing were established in Glasgow in 1738, nearly thirty years earlier than in Lancashire. The dyeing of Turkey-red was inaugurated in 1785 as a British industry by two Glasgow citizens, David Dale and George Macintosh—the colour being known for a long time as Dale's red; and this branch of trade has developed in Glasgow and the neighbourhood to an extent unequalled in any other manufacturing centre. In Glasgow, also, bleaching-powder (chloride of lime) was discovered in 1798 by Mr Charles Tennant, who thereby laid the foundation of the gigantic St Rollox chemical works, and gave the first impetus to chemical works generally. These, along with the spinning and weaving industries which have been centred in the great city factories since the inventions of Arkwright, Cartwright, and others superseded hand-loom weaving, have for the past century afforded employment for a great proportion of the population of the town.

THE UNIVERSITY OF GLASGOW was founded on 7th January 1450–51 by Bishop Turnbull, who procured a bull of ratification from Pope Nicholas V. In 1460 James, first Lord Hamilton, endowed a college on the site—in the densest part of the High Street—of the late buildings, the older portions of which were erected between 1632 and 1656. Queen Mary bestowed on the university 13 acres of adjacent ground. In 1577 James VI. granted increased funds in a new charter. In 1864 the university buildings and adjacent lands were sold for £100,000, and handsome new buildings, designed by Sir G. Gilbert Scott, were erected at Gilmorehill, overlooking the West End Park, and opened in 1870. The total cost was about £470,000, of which £120,000 was granted by parliament, and above £250,000 subscribed and otherwise obtained, chiefly in Glasgow. For the erection of a common hall the Marquis of Bute gave £40,000; and a bequest of £70,000 by Charles Randolph was utilised in completing the buildings. More recent bequests have been employed largely for laboratories and other adjuncts of scientific teaching and research.

Chairs, Office-bearers, Degrees.—The office-bearers of the university consist of a Chancellor, Rector, Principal, and Dean of Faculties. The Chancellor holds his office for life, and was formerly elected by the senate, but since 1875 he is elected by the general council; the Rector is elected triennially by the matriculated students, who are divided, according to their place of birth, into four nations—*Glottiana* (Lanarkshire), *Transforthana* (Scotland north of the Forth), *Rothsciana* (Buteshire, Renfrewshire, and Ayrshire), *Loudoniana* (all other places). In the university there are now (through the recent separation of the faculty of science from that of arts) five faculties: Arts, Science, Divinity, Law, and Medicine; thirty-one professorships (eighteen founded during the nineteenth century), and upwards of thirty lectureships (all of recent foundation). The degrees granted are Master of Arts (M.A.), Bachelor of Science (B.Sc.), Doctor of Science (D.Sc.), Doctor of Medicine (M.D.), Master of Surgery (C.M.), Bachelor of Divinity (B.D.), Bachelor of Law (B.L.), Bachelor of Laws (LL.B.), Doctor of Divinity (D.D.), and Doctor of Laws (LL.D.), the last two being honorary. The university also grants certificates as Literates in Arts (L.A.) to candidates who have attended two sessions, and certificates of various grades to women and students not attending university classes, on the results of local examinations; besides which it has instituted a diploma for teachers. The number of matriculated students in 1870–75 was about 1300; of late years the average number is a little under or a little over 2000, nearly half being in the Faculty of Arts. The students reside outside the college walls; and those in certain classes of the Faculty of Arts wear scarlet gowns. The university, conjointly with that of Aberdeen, returns one member to parliament.

Bursaries and Exhibitions.—There are upwards of 300 bursaries for students still attending lectures,

ranging in value from £6 to £80; and with exhibitions, fellowships, and scholarships (besides 9 common to Glasgow with the other Scottish universities), the amount distributed yearly exceeds £8000. Of the latter the most valuable are the four Clark scholarships, founded in 1872, and each worth £200 a year. The oldest are the Snell exhibitions, founded by John Snell, a native of Ayrshire, who in 1677 presented to the university a landed estate, for the purpose of supporting at Balliol College, Oxford, ten students who had previously studied at Glasgow. Owing to the rise in the value of land, the foundation was made to maintain 14 exhibitioners, who were each to receive £110 a year for five years; but at present the yearly stipend is only £80, with an arrangement that the total sum, £400, may be paid within three years. Several men who have risen to great eminence went to Oxford on Snell exhibitions; among whom may be named Adam Smith, Sir William Hamilton, Archbishop Tait, Principal Shairp, and Lord President Inglis.

Libraries, Museums, &c.—The library was founded prior to the Reformation, and now contains about 175,000 volumes. It is supported by an annual grant of £707 from the Treasury, graduation fees, the contributions of students, &c. Subsidiary libraries are attached to several of the classes, the books being selected with a view to the subjects treated of in each class. In July 1781 the celebrated Dr William Hunter of London framed a will, leaving to the principal and professors of the university his splendid collection of books, coins, medals, and anatomical preparations; and for the accommodation and conservation of these a building was erected in 1804; but they are now located in the new university. The university also possesses an observatory.

Among the men of eminence who have taught or studied in the university are Bishop Elphinstone, John Major, John Spottiswoode, Andrew Melville, James Melville, Boyd of Trochrig, John Cameron, Zachary Boyd, Robert Baillie, Lord Stair, Bishop Burnet, Robert Simson, Hutcheson, William Hunter, Tobias Smollett, Dr John Moore, Adam Smith, Thomas Reid, William Cullen, Joseph Black, Matthew Baillie, Thomas Campbell, Francis Jeffrey, J. G. Lockhart, Sir William Hamilton, Sir Daniel Sandford, Archbishop Tait, Professor Jebb, the two Cairds, and Lord Kelvin.

See John M'Ure, *A View of the City of Glasgow* (1736); John Gibson, *The History of Glasgow* (1779); Andrew Brown, *History of Glasgow* (1795-97); Cleland, *Annals of Glasgow* (1829); Dr Gordon, *Glasghu Facies* (1872); Macgeorge, *Old Glasgow* (1880; 3d ed. 1888); George MacGregor, *The History of Glasgow* (1881); A. Wallace, *Sketch of the History of Glasgow*; *Glasgow Past and Present*, by 'Senex' and others (1882; new ed. 1884); and *Glasgow: its Municipal Organisation and Administration*, by Sir J. Bell and the present writer (1896). For the recent anti-academic and original school of painting in landscape and portraiture that has attracted notice at Paris, Munich, and Venice, see *The History of the Glasgow School of Painting*, by David Martin, with introduction by F. H. Newbery (1897); Guthrie and Lavery are conspicuous representatives.

Glasnevin. See DUBLIN.

Glass (Anglo Saxon *glæs*) is essentially a combination of silica with some alkali or alkaline earth, such as lime, barytes, &c. Generally speaking, it is understood to be a silicate of soda, or a combination of silica or flint with one or more of the salts of sodium, with the addition of certain metallic oxides, &c., as explained on page 239.

History.—The invention of glass dates from the earliest antiquity, and the honour of its discovery has been contested by several nations. As the oldest known specimens are Egyptian, its invention may with great probability be attributed to that people. It is mentioned as early as the 5th or 6th dynasty, about 3300 B.C., and called *bashau*, the Coptic *bjni*; articles made of it are represented in the tombs of the period; while its fabrication is depicted in sepulchres of the 12th dynasty—i.e. about 2500 B.C. The glass of Egypt was generally opaque, rarely transparent, and always coloured, the articles made of it being of small size, and principally for adornment, as beads, vases, small figures, and objects for inlaying into wood or other material. Specimens exist of this glass bearing the name of the queen Hatasu of the 18th dynasty, and vases of blue glass, with wavy lines in white, light-blue, yellow, black, red, and green, of that and a later age, have been discovered. The Egyptians also successfully imitated precious and other stones in glass—as emeralds, lapis-lazuli, turquoises, jaspers, onyx, and obsidian. Transparent glass, indeed, does not appear earlier in Egypt than the 26th dynasty, about 660 B.C., when bottles and a few other objects were made of it.

Under the native Pharaohs, Egyptian glass seems to have been extensively exported to Greece and Italy, and its reputation still continued under the Ptolemies, when the furnaces of Alexandria produced glass vases of numberless shapes and considerable size. Egypt retained the pre-eminence in the manufacture of glass under the Romans, the sand of Alexandria being indispensable for the finest qualities, and it exported glass to Rome. Hadrian, on his visit, was struck with the activity of the manufacture, and sent to his friend, the Consul Servianus, one of the vases, called allosontes, or 'opalescent;' and the Roman writers mention with admiration the melting, turning, and engraving of Egyptian glass. The art of glass-making, in fact, has never become extinct in Egypt, the Fatimite Califs having issued glass coins in the 10th and 11th centuries, and beautiful lamps of glass enamelled on the surface with various colours having been made in the 14th century.

After the Egyptians, the people of antiquity most renowned for glass were the Phœnicians, who were its legendary inventors. Certain of their merchants, says Pliny, returning in a ship laden with natron or soda, and having been compelled by stormy weather to land on a sandy tract under Mount Carmel, placed their cooking-pots on lumps of natron on the sand, which, fused by the heat of the fire, formed the first glass. This statement, introduced by Pliny himself with *fama est*, points only to the great antiquity of the art among the Phœnicians, for the occurrence is a simple impossibility. Sidon, indeed, was early celebrated for her glass-wares made of the sand brought down from Mount Carmel to the mouth of the river Belus. The nature, however, of the earliest Phœnician glass is unknown, unless the opaque little vases of the toilet found in the tombs of Greece and Italy, and the beads of the same discovered in the barrows and tumuli of the old Celtic and Teutonic tribes were imports of the Phœnicians. It is certain that at a very early period the manufactures of the Phœnicians were widely distributed over the Mediterranean coast, and even reached the shores of Britain, where they were exchanged for the mineral wealth of Cornwall. The vases of Sidon were highly esteemed at Rome under the Antonines, fragments of bowls of blue and amber glass, with the names of the Sidonian glass-makers, Artas and Irenæus, stamped in Latin and Greek, having been found in the ruins.

From these two centres, Egypt and Phœnicia, it is probable that a knowledge of the art radiated, and was transplanted into neighbouring countries with the growth of civilisation. The manufacture, it might be inferred, was early established in Assyria, for in his excavations at Nimrud Mr Layard unearthed with other glass remains a vase

of white glass having stamped or inscribed on it a lion and the name of Sargon, who reigned 722 B.C. But this specimen may have been brought from Sidon; and other fragments of glass brought by Layard from the same place are Roman in form, and certainly belong to the period when the Romans there established their colony of Claudiopolis. In Greece the knowledge and use of glass were by no means ancient. In the days of Homer it was unknown. Herodotus, indeed, mentions its employment for earrings, but these may have been of Phœnician fabric. It was called *hyalos*, crystal or ice, and *lithos chytē*, or fusible stone. Aristophanes, 450 B.C., mentions glass or crystal vessels, and various inscriptions confirm its use; but its value was next to gold, which could hardly have been the case if it had been of native manufacture. In the 4th century B.C. Pausias, a celebrated painter, had depicted *Methē*, or 'Intoxication,' drinking from a transparent glass bowl which revealed her face. Glasses and plates, amphoræ and diotæ, large two-handled jars, were made of it, and also false stones for finger-rings, called *sphragides hyalinai*. These last, called by archæologists *pastes*, were imitations of engraved stones in coloured glasses, used for the rings of the poorer classes, and were no doubt often copies or impressions of engraved stones of celebrated masters. False gems and cameos having a subject in opaque white, sometimes like the sardonyx, with a brown layer superposed on the parts representing the hair, and the whole laid on a dark-blue ground, appear before the Christian era. Lenses also were made of glass, and the celestial sphere of Archimedes was made of the same material.

Fig. 1.—Glass Vase, bearing the name of Sargon, from Nimrud.

Among the Romans the glass-making art does not date earlier than the commencement of the empire, importations from Sidon and Alexandria having previously supplied the want of native manufacture; but there is ample evidence of its extensive manufacture at that period. As early as 58 B.C. the theatre of Scaurus had been decorated with mirrors or glass plates disposed on the walls. Glass was also used for paving, and for the blue and green tesseræ of mosaics (see MOSAIC). Window-glass does not appear to have been much used till about the 3d century A.D., the houses at Herculaneum and Pompeii, destroyed in the reign of Titus, being glazed principally with talc; but remains of glass-filled windows have been discovered in both cities, showing that its employment was at least begun in the 1st century. Lactantius, in the 3d century, and St Jerome, in 422 A.D., mention glass windows. Older windows of this material are said to have been found at Ficulnea, and even in London. Under the Romans, coloured as well as white glass was extensively used; it had a greenish tint in the first days of the empire, but had sensibly improved in colour and quality in the days of Constantine. The first production of a white glass like crystal, probably much freer from air-cavities and other imperfections than had previously been accomplished, was in the days of Nero. Its use was most extensive, and it was either blown or stamped according to the objects required. Glass vases, *vasa vitrea escaria potoria*, are mentioned. So are costly cups of many colours, purple ones of Lesbos, and balsamarii, especially the kind long called lachrymatories, which held perfumes, medicine, drugs, and other substances like modern vials, amphoræ, ampullæ, pillar-moulded bowls, bottles for wine (*lagenæ*), urns (*urnæ*) for holding the ashes of the dead, and pillar-moulded bowls or cups (*pocula*), hair-pins, beads, rings, balls, draughtsmen, dice, knuckle-bones (*astragali*), mirrors, multiplying-glasses,

Fig. 2.—Moulded Glass Roman Cup, with the Circus and Gladiators, found in London.

prisms, magnifying-glasses, and water-clocks were made of this material. Most of the precious stones were successfully imitated in glass pastes; and the Empress Salonina was egregiously cheated by a fraudulent jeweller. But the most remarkable works in glass are the cameo vases (*toreumata vitri*); of which the most celebrated is the Portland Vase (q.v.) in the British Museum, which seems to have held the ashes of a member of the imperial family of Alexander Severus, who died 235 A.D. A vase of smaller size, but of similar fabric, with arabesques, found at Pompeii, exists in the Naples Museum; and numerous fragments of even finer vases, some with five colours, exist in different museums. In the reign of Tiberius an adventurer pretended that he had invented flexible glass, and threw down a vase which only bent, and which he readjusted with a hammer; he seems to have connected it in some way with the philosopher's stone, and the emperor is said to have banished him or put him to death. In the 3d century A.D. appeared the *diatrēta* or 'bored vases,' consisting of cups (*pocula*) having externally letters and network almost detached from the glass, but connected by supports; all which must have been hollowed out by a tool, involving great labour. One vase of this class, bearing the name of Maximianus, who reigned 286–310 A.D., found in the vicinity of Strasburg in 1825, and preserved in that city, fixes their age. At a later period bowls of engraved glass, having subjects of gladiatorial fights, came into use. Still later, apparently in the 5th century, a new style of glass ornamentation was introduced, consisting of the figures of Christ and legends of saints, and the portraits of private persons laid on in gold upon one layer of glass, over which was placed another through which they appeared. While the art of glass-making declined in Rome with the decay of the empire, its practice was transferred to Constantinople, and there it continued to flourish under the Eastern Empire throughout the dark ages; the artificers impressing on their products that peculiarity of form and ornamentation which is known

as Byzantine. The Byzantine manufacturers became specially famous for the production of glass mosaics; and throughout the middle ages there are many notices of mosaic decorations derived from Constantinople. From the Byzantines the Arabs obtained a knowledge of glass-making, and 'glass of Damascus' attained celebrity in medieval times through the numerous examples brought to western Europe by Crusaders.

It is most probable also that the great centre of the glass industry of medieval and more recent times, Venice, received its early impulse and lessons from Constantinople. The art began there with the beginning of the city in the 7th century A.D.; but it experienced a marked improvement after the conquest of Constantinople in 1204, and in 1291 the establishments were removed to the island of Murano, the manufacturers forming a guild with a Libro d'Oro, or register of nobility, and guarding their secret with the greatest jealousy. In 1436 their colour-glass came into note, and continued so till the close of the century; and in the 16th century lace-patterns and mirrors were introduced. In the 15th and 16th centuries plain glass with tasteful ornaments gilt and enamelled; in the 16th, crackled lace and reticulated glass, *cristallo di trino*; and in the 17th century variegated or marbled glasses were produced. The

Fig. 3.—German Drinking-glass.

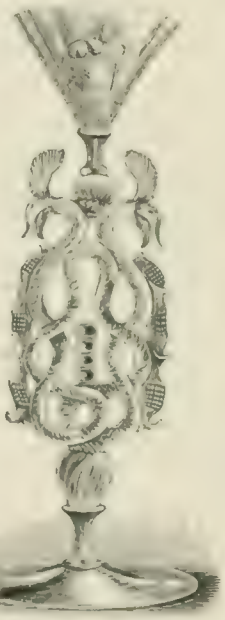


Fig. 4.—Venetian Glass on open-work stem.

millefiori glass extends through all periods, and seems to have been derived from the Roman, being continued to the present day, when large quantities of this glass in the form of beads are annually imported to England, and transported to Africa and Asia in the way of trade. The Venetian glass enjoyed for a long time the monopoly of commerce, the mirrors, goblets, and cups being exported all over the world, and within recent years there has been a marked revival of the skill and enterprise of Venetian craftsmen. The forms of the Venetian glass reflected its oriental origin, and the earlier glass of other countries of Europe in turn shows the derivation of their art from Venice. In Germany the oldest glass (which was flint) dates from the 16th century, and consists of goblets and tankards of white colour, enamelled with coloured coats of arms and other devices, millefiori, and schmeltz glass. Engraved glass was first introduced by Caspar Lehmann at Prague in 1609 under imperial protection, and continued by his pupil G. Schwanhard; and ruby glass by Kunckel in 1679. Glass is said to have been made in 1294 at Quinquengrone, in Normandy, and a common kind was made later in Dauphiné and Provence. In 1665 twenty Venetian glass-workers were brought by Colbert to Paris, where they set up the blowing of glass and the silvering of mirrors, the famous mirror hall in Versailles having been furnished by them. In 1688 an exclusive privilege of making large plates of glass by casting was conferred on Abraham Thevart. It has been discovered that the name Thevart was assumed by a syndicate of capitalists formed to develop and work the invention of Louis Lucas de Nehon, who was the real inventor of plate-glass and the founder of the Gobain works—to this day one of the most extensive plate-glass works in the world. In 1865 there was placed a memorial over the door of the chapel of Gobain with the following inscription: 'Louis Lucas de Nehon inventa en 1691 la methode de couler les glaces, et installa la manufacture, en 1695, dans le château de Saint Gobain, ou il est mort, en 1728.' In France, oxide of lead flint-glass was made at St Cloud in 1784; another manufactory was subsequently established at St Louis in 1790; and the St Cloud establishment was removed to the vicinity of Mont Cenis, where it flourished till 1827.

It is uncertain whether glass was made in England before the 16th century, as that mentioned may have been imported from Flanders or Venice. In 674 Benedict Biscop introduced makers of glass windows into Northumbria; but window-glass was not in general use for windows till the 15th century. In 1557 flint-glass was manufactured at the Savoy and Crutched Friars; in 1565 there were glass-works under Cornelius de Launoy; and in 1567 Jean Quarre and other Flemish manufacturers established works at Crutched Friars, which Quarre's descendants extended to Sussex. In 1615 Sir R. Maunsell obtained a patent for making glass, in consideration of using pit-coal instead of wood, and oxide of lead was then introduced in 1635; and in 1673 Venetian artists, brought over by the Duke of Buckingham, manufactured mirrors of plate-glass at Lambeth, and drinking-glasses were made at this period. But Venetian glass was extensively imported. In 1771 the company of British Plate-glass Manufacturers was established at Ravenhead, near Prescot, Lancashire. Patent plate, which consists of fine sheet-glass polished, was first made by Messrs Chance of Birmingham in 1840. In Scotland the manufacture was introduced in the reign of James VI., and George Hay obtained a patent for thirty-one years. The first glass was manufactured at Wemyss, in Fife, afterwards at Prestonpans and Leith. In 1661 only the principal chambers of the king's palace had glass. In America attempts seem to have been made to establish glass-works at Jamestown, Virginia, in 1608–22; at Salem, Massachusetts, in 1639–40; in New York city before 1664; and in Pennsylvania before 1683. Subsequently works were established in 1780 at Temple, New Hampshire; in 1792 at Boston; and in 1797 at Pittsburg. Plate-glass was first made there in 1853, and it is also made at Baltimore and New York.

At an early period the application of glass for magnifying lenses appears to have been known. Ptolemy II. had a telescope mounted at the Pharos, and globes filled with water were in use for the purpose of magnifying under the Romans. Lenses are mentioned in the 12th century A.D. by Alhazan,

and by Roger Bacon in the 13th century; towards the close of which Salvino d'Armato invented eyeglasses, which were subsequently improved by Alessandro Spina. Glass-reflectors for telescopes, of great size and accuracy, have been made in France (see TELESCOPE).

As regards processes of making, that called the cylindrical was used by the ancients, and is mentioned by Theophilus at the end of the 12th century. The rotatory process was first introduced in Bohemia, subsequently into France in 1730, but not into England till 1832. Pressed glass was invented in America. In England there were twenty-four window-glass factories in 1847, and only seven in 1866. In 1889 there were in the United Kingdom 43 manufacturers of flint-glass, 4 of sheet, 4 of polished plate glass, 7 of rolled or rough plate-glass. The value of the export of glass from Britain increased from £26,694 in 1848 to about £500,000 in 1855; in 1887 it was £1,021,029, and in 1888, £1,109,341. The value of the foreign glass of all kinds imported in 1887 was £1,674,268, and in 1888 was £1,906,770. In 1880 the glass manufacture of the United States gave work to 211 establishments, employing 24,177 hands. Of the total product, with a value of $21,154,571, over two-fifths were made in Pennsylvania, and nearly an eighth in New Jersey. The export of glass and glassware had in 1886 a value of $773,878, in 1887 of $883,504. The imports had a value of $7,301,340 in 1887.

Manufacture.—In its ordinary state, glass is a solid body with a characteristic lustre called vitreous, and a conchoidal or shell-like fracture when broken, best seen in pieces of some thickness; further, it is more or less brittle, a property which arises from its outer and inner molecules cooling from a state of fusion at a very unequal rate. It is usually said to be amorphous, but perhaps it rather represents a stage between the perfectly amorphous and the crystalline states. A tendency in his glass to crystallise in cooling is one of the things a glass-maker dreads. Glass is commonly transparent, although this property is not an essential one, since a true glass may be almost opaque, or at most translucent, even when very thin. Glass when softened by heat is highly tenacious, and may be easily moulded into all conceivable shapes; it welds when red-hot; at a lower heat it is plastic, and may be cut with knives and scissors; when cooled it is usually quite brittle. But molten glass can be rapidly drawn out into long threads hundreds of feet in length, and such threads retain when cooled sufficient flexibility to be woven into a beautiful silky fabric.

The chemical composition of glass differs with the different kinds. It is essentially a silicate of soda or of potash combined with a silicate of some alkaline earth or other basic body, such as the oxide of lead. Silica with potash or soda alone, or with both, forms a soluble glass unfit for windows or vessels of any kind. The following table gives the composition of the chief kinds of glass:

(1) Window-glass, including crown, sheet, and plate: silicate of soda and lime.
(2) Bohemian Crystal-glass: silicate of potash and lime.
(3) Flint-glass, often called crystal-glass or simply crystal: silicate of potash and lead.
(4) Bottle-glass—that is, of the common kinds: silicate of lime and alumina; with smaller quantities of the silicates of potash or soda, iron and manganese; the silicates of baryta and magnesia being also frequently present.

There are some other kinds made on a more limited scale, such as optical glass, strass, and enamel glass. Any of the above kinds of glass may be coloured by the use of certain metallic oxides.

Raw Materials.—For the better kinds of glass these are the following: *Silica*, employed chiefly in the form of sand, of which an abundant supply, sufficiently free from iron for ordinary window-glass, is to be found in England. For the best qualities of plate and flint glass, in which purity of colour is essential, manufacturers have recourse to the sands of France and Belgium. *Potash*, as pearl-ash, or wood-ashes, or the sulphate of potash. *Soda*, in the form of carbonate or sulphate of soda. *Lime*, in the state of caustic lime, chalk, or ordinary limestone, if sufficiently pure. *Baryta*, from heavy spar or witherite; but barium compounds are as yet only to a limited extent employed. *Lead* is safest used in the form of red-lead (peroxide), a quality free from copper, which would impart colour, being specially made for glass-makers. *Carbon*, in the form of charcoal or powdered anthracite coal, for the decomposition of the alkaline sulphates. *Cullet* or broken glass of the kind intended to be made. All the above materials must be as free as possible from iron or other impurities when colourless glass is required; and, in order to prevent any iron or carbon present from tinging the glass, small quantities of oxidising agents, as nitre, arsenious acid, and peroxide of manganese, are also employed. Bottle-glass is made of comparatively coarse materials, as will be presently seen.

Glass Pots, or Melting-vessels.—These require to be very carefully made of some very refractory clay, since the cracking of one in the furnace, which sometimes happens when it is newly put in, is a considerable loss to the manufacturer. In Great Britain the famous Stourbridge fireclay is nearly always used for them. It is almost wholly composed of silica and alumina with water, and is nearly free from oxide of iron or other easily fusible ingredient. Much attention is given to the preliminary preparation of the clay, called tempering. It is then put into large cisterns, mixed with water, and kneaded with the naked feet, which renders the clay of a uniform consistency and free from air cavities; but it requires to be turned over and kneaded repeatedly. After a week or two, it is removed to large tables, where it is mixed with the ground fragments of old pots, and carefully worked into a plastic mass. This prepared clay is next made up into small rolled pieces, with which the pot-maker slowly builds up the pot, adding only a few inches to its height in a day. Foreign pots are made in moulds of thick wood strongly hooped with iron, but in England entirely by hand. The pots are usually kept several months in stock, after which they are annealed by being kept for a few days at a red heat, in which state they are transferred to the glass-furnace for use. New pots require to be 'glazed' by throwing in a quantity of broken glass, which protects them from the further action of the materials used in glass-making. Fig. 5 represents a pot for window or bottle glass, and fig. 6 a flint-glass pot, which has always a covered top.

Fig. 5.

Fig. 6.

Furnaces.—The furnaces which have been long in use for its different kinds will be noticed in turn as we describe the processes of making glass; as, however, the Siemens furnace has come into extensive use in various departments of the glass manufacture, it is necessary to give an idea of its construction. A general description of this furnace is given under IRON; but we give here a plan (fig. 7),

and a cross section (fig. 8)—the latter showing the brick regenerators of that form of it called the continuous tank furnace in which no pots are used —a form which is now largely employed in making bottle-glass, rolled plate, and sheet glass. For most kinds of glass pots are still used in the

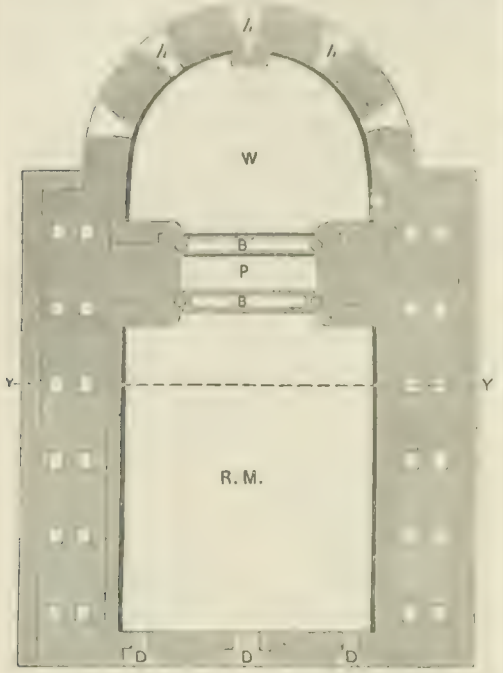


Fig. 7.

Siemens as well as in the older kinds of furnaces; where pots are preferred, the chief difference is that a flat platform is prepared for their reception, instead of the bed of the furnace being in the shape of a tank or cistern.

The figures are to some extent rather diagrams than exact representations of the furnace, since, otherwise, more woodcuts than we can find room for would be required to explain it. In the plan (fig. 7), RM is the compartment into which the raw materials are fed by the doors, D. When the glass is partially melted, it passes under the first floating bridge of fireclay, B, which keeps back floating impurities. In compartment P the glass is completely melted, and it then passes in a pure state under the second floating bridge, B′, into the compartment W, where it is ready for use; *h*, *h*, *h* being the working holes. The space under RM in fig. 8 is an air-flue for the purpose of keeping the tank cool. In the section (fig. 8), A and G represent the air and gas regenerators on the left, and A′ and G′ the corresponding ones on the right. The gas-producers are not shown, but, as explained under IRON, the air and gas are fed for a certain time through A and G respectively to the bed of the furnace; and, while this is the case, the products of combustion descend through A and G′ on the right, by which the piles of open brickwork become in time highly heated. By a proper arrangement of flues and valves, this process is then reversed, so that the gas and air now enter the furnace on the right, robbing in their course the hot bricks in A and G of their heat, and carrying it back to the bed of the furnace. This time, of course, the products of combustion escape through A and G on the left, by which these regenerators become in turn heated, thus saving heat which is lost by escaping up the chimney in ordinary furnaces. In a subsequent specification Messrs Siemens replaced the fixed partitions by bars or girders of fireclay or other refractory material, which float transversely on the surface of the molten matter, the upper stratum of which they divide into compartments. The partially melted material is thus kept at the supply end of the tank, and only the more thoroughly melted and purer matter is permitted to flow towards the working end under these floating bridges. More recently partitions, whether fixed or floating, have been for the most part dispensed with, and the tank forms one huge, long basin. Floating vessels made of pot-clay, divided into three compartments, or two compartments and a floating ring, do the work of separating the refined from the crude matter.

Bottle glass. The tank furnace, without bridges, to which reference has just been made, is admirably adapted for the manufacture of bottle-glass, and has superseded the system of melting in pots. In the composition of this glass a great variety of materials is admissible in conjunction with sand, which forms the basis of this as well as of all other kinds of glass. The residual alkaline and calcic salts from gas, soap, and alkali works, sulphate of soda, clay, common salt, chalk, basalt, and other rocks containing felspar, and lastly the slag from iron blast-furnaces are the materials chiefly in use. When the glass is properly melted and skimmed, a workman dips a long iron tube called a blowpipe into a pot or tank and takes up (on repeating the operation) a 'gathering,' or sufficient metal to make a bottle (*a*, fig. 9). Another workman brings this into a pear-shape (*b*, fig. 9) by slightly blowing and turning it on a stone or iron table, called a *marver*. Formerly the further manipulation of the bottle was done by hand, but moulds are now used. These are usually of cast-iron or

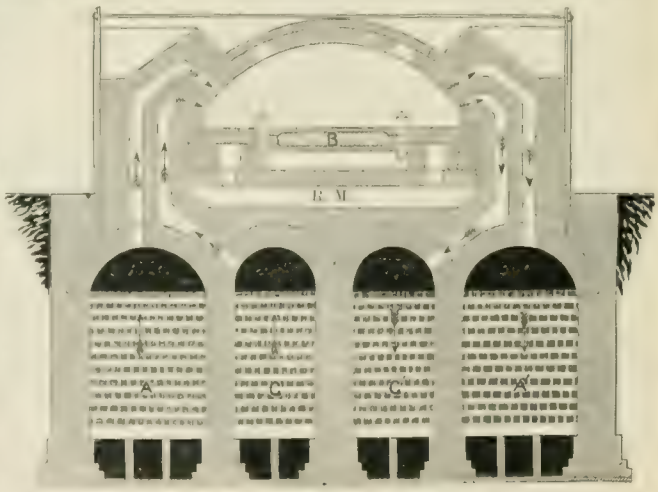


Fig. 8. Cross Section on YY, fig. 7.

brass, or sometimes of clay, and open or close by the pressure of the foot on a spring. Into such a mould the partially-distended glass is inserted, and made to fill it by blowing down the tube, the

bottom being pushed up with a pontil, and the ring round the mouth afterwards made by the addition of a strip of metal.

Annealing.—When the glass-blower has finished a bottle, it is immediately taken to the annealing oven, where it remains for some thirty-six hours, during which time it cools very gradually from almost a softening heat to the ordinary temperature of the air. This process is a very important one in the manufacture of all kinds of glass, because when newly made into vessels or sheets it is so fragile that it will scarcely endure touching. The molecules are then under a strain from the outside portion of the glass cooling much quicker than the inner; but this is in a great measure rectified by annealing it, and so a proper strength is acquired.

Window-glass.—Crown and sheet glass are the very same in respect to composition, and plate-glass only differs from them in that the proportion of lime is usually less, and the materials more carefully selected with regard to purity. In England sheet-glass is made from mixtures of which the following is an example. Sand, 100; sulphate of soda, 40 to 45; chalk or limestone, 40; powdered anthracite coal, 2; cullet, 100; small quantities of those bleaching or oxidising agents already noted being added as required.

Crown-glass.—Before the repeal of the duty on glass in 1845 this glass, then almost the only kind used in England for windows, sold at £12 per crate, from which price it had fallen in 1865 to £2, 8s. Its manufacture is now practically given up in favour of sheet-glass, at first called German or Bohemian sheet, the price of which has fallen in a like degree. Crown-glass being in large circular discs, much waste is caused by cutting these into rectangular pieces, and by the thickened lump or bull's-eye in the centre of the disc. In past days these objectionable bull's-eye pieces were stuck into cellar-windows, and it is not a little curious that these are now being made, though of smaller size and in coloured glass, in large numbers for ornamental windows.

The metal being brought to a workable condition and skimmed, a sheet of crown-glass is made in this way: A workman, by dipping his

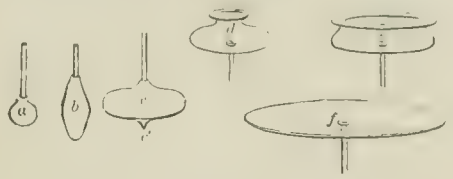


Fig. 9.

long iron blowpipe two or three times into the pot, takes up on the end of it a gathering of about 10 lb. of metal, which, when the pipe is held upright, lengthens by its own weight into a bulb shape (*a*, fig. 9). Rolling this on the marver, the workman makes the outer portion conical, and then, by blowing, forms it into a pear shape (*b*, fig. 9). Further heating and blowing brings it into the shape of a flattened sphere, and to a much increased size (*c*, fig. 9), with a point *c'* called the bullion point.

At this stage the glass is transferred from the blowing-pipe to an iron rod (ponty), on the end of which a lump of hot iron metal has been placed. This lump is made to assume the form of a little cup by pressing it on an iron point, and is then pressed against the bullion point of the flattened sphere, to which it becomes firmly attached. The pipe is detached by means of a piece of iron dipped in cold water (*d*, fig. 9). The globe of glass is now held with the ponty. The operator next carries it to the nose-hole, and presents the opening formed by the detachment of the blowpipe to the action of the furnace; this again softens the glass, which is then taken to the flashing furnace, and kept continually revolving, by turning the ponty on a rest in front of the furnace opening. The revolutions are at first slow, but are gradually accelerated as the softening of the glass goes on, and the centrifugal force so produced throws the edges of the orifice outwards, as in *e*, fig. 9. As the glass flattens, it is revolved with greater rapidity, and advanced so near to the mouth of the furnace as to draw the flames outward, by contracting the draught. This completes the softening of the glass; it then opens suddenly, with a rushing noise like the unfurling of a flag in the wind, caused by the rapid flying outward of the softened glass and the rush of the flames outwards. It becomes perfectly flat, and of equal thickness, except at the bullion or centre (*f*, fig. 9). The *flashing* is now complete; and after being detached from the ponty, it is taken to the annealing oven, into which it is passed through a long horizontal slit which forms the opening, and when fairly in, it is dexterously turned on its edge. Here it remains at a temperature somewhat below that required to soften glass, until the oven is filled with these so-called *tables* of glass, when the heat is suffered to decline, until the whole is cold, when they are removed to the packing-room, to be packed in crates for sale.

Sheet or *cylinder glass*, as already stated, has now almost entirely displaced crown-glass for windows. The Bohemian process, at present practised, was introduced from France in 1832, although a very rude kind of sheet-glass had been previously made in England. Sheet is made in a quite different way from crown glass, inasmuch as a long and perfect cylinder is sought to be produced by the *blower* instead of a sphere of glass. Very much larger sheets can be obtained by this than by the crown-glass process, as the form is rectangular and there is no lump in the centre. In some works the largest sizes are made with the aid of a mechanical apparatus for swinging the cylinders, called an 'iron man.' Fig. 10 shows a ground-plan of an eight-pot furnace heated by gas. The gas and air are supplied through the five apertures, called 'ports' (three for gas and two for air, or *vice versâ*), which are placed at either end of the furnace, below or on a level with its bed, each end forming the entrance and exit alternately (*vide* description of the reversing system, fig. 8). This is the furnace originally designed by Messrs Siemens, and adopted by Messrs Chance in 1861. Since that period the patentees have introduced various modifications, but it is questionable whether they have improved upon their original design. In very long furnaces it is better to place the ports between the pots, and in a line parallel to the sides of the furnace. In this system the pots are heated partly by the direct action of the flame, and partly by radiation from the crown of the furnace. In his latest specifications Mr F. Siemens has taken a new

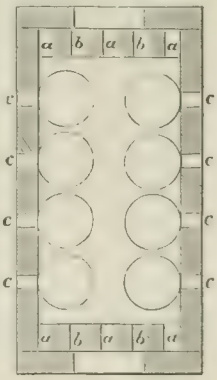


Fig. 10.

a, apertures for entrance of gas; *b*, apertures for entrance of air; *c*, working holes over pots.

departure, and introduces the gas and air at a considerable height above the pots, the heat being thus obtained entirely by radiation. This arrangement is applicable to tanks as well as to pot furnaces. Fig. 11 shows the system of heating by radiation as adapted to a long furnace

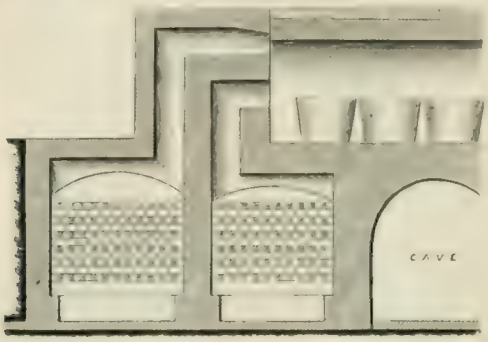


Fig. 11.

holding, say, 30 pots; for a shorter furnace the arrangement is modified, the pots and the ends of the furnace being curved. The workman, having made his gathering (*a*, *b*, fig. 12), forms it into a cylindrical mass of the diameter required by blowing and turning it in the cavity either of a solid block of wood which is sprinkled with water, or of a hollow metallic block which is kept cool by water passing through it. By more blowing and swinging over the head, the workman brings it by degrees nearer to the form of an elongated cylinder (*c*, *d*, fig. 12). As it cools rapidly in this operation, he from time to time places his pipe in the rest before the furnace-mouth, and, gently turning it round, he brings it again nearly to the melting-point; then he repeats the blowing and swinging, standing over the pit, to enable him to swing it completely round as it lengthens out. These operations are continued until the cylinder has reached its maximum size—i.e. until it is of equal thickness throughout, and sufficiently long and broad to admit of sheets of the required size being made from it (*e*, fig. 12). Sometimes these cylinders are made 60 inches in length, allowing sheets of glass 49 inches in length to be made from them, but the Belgians make them much larger. In the Vienna Exhibition they exhibited sheets 10 × 4 feet. The next operation is to place the pipe in the rest, and apply the thumb so as to close the opening at the blowing end: the heat of the furnace soon softens the glass at the closed extremity of the cylinder, and, as the enclosed air is prevented escaping, as it rarefies, by the thumb placed on the opening of the blowpipe, it bursts at the softened part (*f*, fig. 12). The operator then quickly turns the cylinder, still

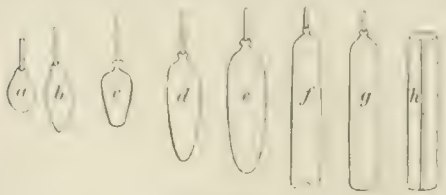


Fig. 12.

with its end to the fire, and the softened edges of the opening, which at first are curved inwards, are *flashed* out until they are in a straight line with the sides of the cylinder (*g*, fig. 12). It is then removed, and placed on a wooden rest or chevalet. Just at the shoulder near the blowpipe the workman wraps round a thread of red-hot glass, which after a few seconds he withdraws; then he applies his cold shears quickly, and the shoulder and neck drops off as neatly as if cut with a diamond. The removal of this neck of glass can also be effected by drawing a red-hot iron rod round the shoulder, and then dropping a little cold water upon it. The continuous tank furnace, and the pot furnaces of France and Belgium, are so arranged as to serve for both melting and blowing. In England the manufacturers who employ pot furnaces prefer to have a separate construction, called the 'blowing-holes,' for the reheating and manipulation of the cylinder. The advantage of this method, as regards pot furnaces, is that the heat of the blowing-holes, being independent of the melting process, can be adjusted to suit the requirements of the blower.

The finished cylinder (*h*, fig. 12) is split open by a diamond attached to a long handle, and guided by a wooden rule. This was formerly effected by a red-hot iron rod. It is then taken to the flattening kiln, where it is laid with the split upwards on the flattening stone, which is generally covered by a sheet of glass called a 'lagre,' to protect the cylinder from the irregularities of its surface. Here the heat is sufficient to soften without melting the glass, and the *flattener*, as it softens, opens the two edges of the crack until by its own weight the sheet falls flat on the stone; he then takes an implement in the form of a rake, made by placing a piece of charred wood transversely at the end of a long handle, and this is gently rubbed over the glass, producing a very smooth surface. The annealing kiln is immediately at the back of the flattening arch, and the flattening stone mounted on a wagon and carrying the sheet of now flat glass is moved into the annealing chamber. Here, when cooled enough to bear moving, the sheet is first placed horizontally, and afterwards with others piled upright. The wagon is in this way moved from one chamber to the other with successive sheets of glass until the annealing oven is filled. The oven is then closed up so that it may be free from draughts, and allowed to cool slowly down for a period varying from three to five days. The annealing may be accelerated by substituting for the oven a series of iron boxes on wheels, which are filled in succession with the sheets on edge, and pass on when full into a cooler place. There is another and more modern form of lear in which the flattened sheets are passed through the annealing chamber one at a time. A single sheet will cool very rapidly, and at the end of about half an hour will emerge thoroughly annealed.

Glass shades are made in the same manner as above described; they are nothing more, indeed, than the rounded ends of the cylinders before being burst. When wanted oval or square, these forms are produced by the use of boxes of wood charred inside, of the size of the shades required, through which the cylinder is passed, when being blown, until the soft glass touches and receives its shape from the inside of the box or mould; they are afterwards annealed, and cut to the lengths required.

Plate-glass is made in a totally different manner from crown or sheet. Great care is taken in the selection of the materials, as they require to be of a purer kind than those used for ordinary window-glass. From its thickness, any impurity of colour is readily noticed, and, on account of its flat surface when polished, air-cavities are conspicuous defects. The sand used must be as free as possible from iron, the staining power of which is most usually corrected in the case of plate-glass by the addition of a little arsenious acid. Almost every manufacturer has his own private receipt for the mixture

of materials, but the following may be taken as an average: Fine sand, 100 lb.; refined sulphate of soda, 42 lb.; carbon in powder, 2½ lb.; carbonate of lime, 20 to 25 lb.; arsenic, 8 oz.; cullet, or broken plate-glass, *ad lib.* Refined sulphate has completely taken the place of carbonate of soda. When the materials have been melted, and the glass is ready for use, the pot is lifted out of the furnace (fig. 13) by means of the forceps, and wheeled up to the casting-table (fig. 13); here it is seized by a crane and tackle, by which it is lifted, and so nicely poised over the table that it can be easily tilted so as to pour out its contents. All this requires so much care and steadiness that the men, impressed with the great danger of carelessness, usually preserve perfect silence during their work. The table is of large size—usually about 30 feet in length, by 10 to 20 feet in width. When the red-hot glass, which is not in a very liquid state, is poured on, it immediately begins to spread; two strips of iron, a little thicker than the plate is intended to be, are placed on each side of the table, and a steel or cast-iron roller is laid across, resting on these strips,

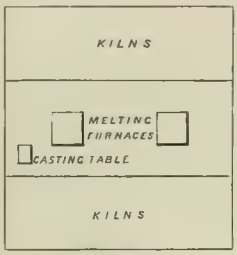


Fig. 13.

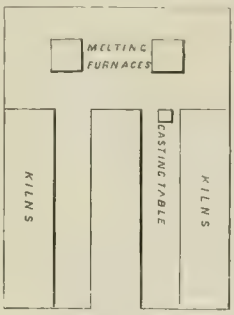


Fig. 14.

which regulate the thickness of the plate, and also, by their distance apart, determine its width. The roller, passing backwards and forwards at a uniform speed over the table, spreads the glass into a plate of the size required. In some works the casting-table with its apparatus is run on rails from kiln to kiln, and in this case the plate is pushed direct from the table into the kiln. In other works (and this is the more modern plan) the casting-table is fixed, and the plate is pushed from it on to a movable table, and thence into the kiln. The annealing ovens or kilns are large shallow brick chambers, in which the plates lie during the process of annealing, and which are heated to a suitable temperature prior to receiving the glass.

It is obvious that in the arrangements of the casting hall considerable variety is possible. In the older works the furnaces were in the middle, and the annealing kilns on either side. Fig. 13 represents a hall of this kind. Fig. 14 is a more modern arrangement, and, of course, other combinations can be adopted. When the plates are sufficiently cool to be removed from the kilns they are carefully examined, and such as are sufficiently free from defects are taken to the grinding-room. Formerly the grinding process was accomplished by rubbing one plate upon another, with sand interposed, both plates being bedded in plaster. At the present time for the upper glass is substituted a rubbing plate of cast-iron, both the lower plate of glass and the upper one of iron being set in motion while in contact by machinery adapted for the purpose. In the preliminary stage of grinding, sand and water are used; but, when the greater portion of the rough surface of the glass has been removed, the process is completed by using powdered emery of the coarser sorts. When one surface of the glass has been thus treated, the operation is repeated on the other. The next process is that of smoothing, for which a separate machine is required. Instead of cast-iron plates, one sheet of glass is used to rub upon another, the upper sheets which are movable being weighted. Emery of the finer description is used in this process, the final touches being given by hand, with the aid of the very finest emery powder. After both sides have received this smoothing, the plates are removed to another room, where they are again embedded on tables which are movable by machinery, so that the whole surface of the plate may be brought under the action of the polishers. These are padded iron buffers attached to short iron rods passing through holes in a beam acted on by springs or weights. The buffers are covered with felt, and rub the glass as it passes from side to side; the surface of the glass being supplied with oxide of iron, in a very fine state of division and mixed with water. When any inequalities are encountered, the springs yield and allow the buffers to pass freely over them. An older plan of polishing is to use wooden rubber-blocks covered with felt.

Rolled Plate.—Mr Hartley, of Sunderland, introduced about 1850 a method of making rough plate-glass suitable for roofs and other purposes where light only is required without transparency. The casting-table has generally a series of fine grooves upon it, but it can be marked with any required pattern. Very large pots or continuous tanks can be used for this process, as only a ladleful of glass is required for each sheet. Quite recently rough plate has been made by passing the contents of the ladle between two rollers revolving in opposite directions, but the glass thus made has not as yet superseded that made by Mr Hartley's process.

Patent Plate.—Sheet-glass made by the cylinder process, when free from flaws and of good colour, is to a limited extent ground and polished much in the same way as ordinary plate-glass, but it is rather higher in price. However, its lightness is an advantage for some purposes, such as the glazing of picture frames and for photographic negatives. It is called patent plate to distinguish it from cast plate-glass.

Qualities of Plate-glass.—It is of importance to know that there is a great difference in the quality of plate-glass supplied by different manufacturers. We do not refer to air-cavities or other imperfections which can be readily seen, and from which the highest-priced glass, such as that used for mirrors, is almost entirely free; but to a defect by which the transparency of the whole surface of the glass is impaired. It will often be found, for example, that, of two plates apparently equally pure and free from flaws, one will take on a peculiar dimness a few days after being cleaned, while the other will remain quite clear and transparent for as many weeks. Plate-glass which does not keep long clean—to use a homely phrase—may often pass unnoticed for a long time until experience of a better quality calls attention to it. Some inferior qualities of 'pressed glass,' noticed below, also take on a kind of scum even when newly cleaned, a fault most readily noticed in plain articles.

Flint-glass.—M. Bontemps in his *Guide du Verrier* gives the following mixture for ordinary flint-glass: Sand, 100; red lead, 66·66; carbonate of potash, 33·33—i.e. one part of carbonate of potash, two of red lead, and three of sand. Sometimes a little peroxide of manganese is added, and a portion of the carbonate of potash may be replaced by refined nitrate. Cullet is usually added to the extent of about one-fourth part of the whole mixture. The pots for flint-glass (fig. 6) are covered or hooded, so as to protect the melted glass from any impurities in the flames of the furnace. The materials used are

very carefully selected, as the glass must be of great purity; the greenish tint in sheet or plate, due to the soda, would be very objectionable in flint glass. Its brilliant flashing appearance, when cut into suitable patterns, is owing to its high power of refracting and dispersing light, a property arising from its comparatively high density. The working of flint glass resembles in a general way that of the other kinds; and, as we have not room for details, we note here a list of the stages in making a wine glass, to give an idea of the process up to the point where the manipulation of the metal in a welding state finishes: (1) Gathering of metal; (2) same marvered, and bowl formed; (3) glass with metal for stem dropped on; (4) same with stem formed; (5) same with foot stuck on; (6) same with foot heated and half opened; (7) same with foot opened, bowl cracked off, heated, and sheared; (8) same finished. It is then annealed. Crystal is a name loosely used for superior kinds of glass.

Optical Glass.—This is made both of flint and crown glass. In the case of lenses for a telescope, for example, a combination of the two kinds is necessary to make it achromatic, their unequal densities conferring upon them different refractive powers. Good flint-glass for optical purposes is extremely difficult to make, especially when the required slabs or discs are of large size. It must be perfectly homogeneous and free from striæ, and it will be deficient in refractive power if it does not contain a very large proportion of lead, which, from its weight, has a strong tendency to settle at the bottom of the crucible, and so destroy the homogeneity of the glass. 'The fused glass is therefore continually stirred until it has cooled to a consistency sufficiently thick to prevent the lead settling, and is then left still in the crucible to complete the cooling. When cold, the crucible is broken away, and the result is a cake of immensely heavy glass, of which it is not yet known whether the value is to be calculated in pounds or pence.' It is afterwards reheated, brought to the required disc-like shape, and then tested for flaws. If these are numerous, as many smaller discs or slabs are taken from it as possible. Messrs Chance of Birmingham supplied in 1871 a pair of discs 26½ inches in diameter for the telescope of the Washington Naval Observatory. The Lick Observatory and other large discs will be mentioned under TELESCOPE. The hard crown made by the above firm has a density of 2·485; soft crown, 2·55; light flint, 3·21; and double extra dense flint, 4·45. A great many experiments in connection with optical glass have been tried of late years with chemical substances other than those we have named, the results of which will be found in the Reports of the British Association for the Advancement of Science.

Slag-glass.—The slag from iron blast-furnaces is itself a coarse glass, but, until lately, it has been a waste product in the fullest sense. Bricks, however, have been successfully made from it of late years; and still more lately, under a patent obtained by Mr Bashley Britten, glass bottles are being made from it by a company in Northamptonshire. The slag is used in the molten state as it runs from the iron-furnaces, which, of course, so far saves fuel; but it requires to be mixed to the extent of nearly one-half its bulk with other materials. The process is said to be successful; yet we fancy there must be great difficulty in procuring, for any length of time, slag of nearly the same composition. *Slag-wool* is a name for the same iron-slag when blown into glass threads of a hair-like fineness, in which state it somewhat resembles wool, and is now much used for covering steam-boilers, it being, like all glass, a powerful non-conductor of heat.

Toughened Glass.—Much curiosity was excited when, in 1875, M. de la Bastie, a French engineer, announced that he had succeeded, after many experiments, in making glass so 'tough' that it could scarcely be broken. So great was the value which the inventor attached to his process, that he demanded no less than one million sterling for the English patent right, and abroad it was proposed that the purchaser of the patent should pay so much per head of the population. His original process consists in heating any piece or pieces of glass till they are about to soften, and then plunging them into a bath of oil at a greatly lower temperature. Usually, however, a mixture chiefly of oily substances, such as oils, tallow, wax, rosin, &c., is put in the bath; and some manufacturers, who worked the process for a time, dropped the newly-made glass vessels while still hot into the oleaginous mixture, by which plan neither reheating nor annealing by the ordinary process is required. After the articles acquire the temperature of the bath, they are removed. Either from the want of care or from some other cause, the results of the treatment of glass by De la Bastie's process are not uniform, because many samples of his toughened, or, as it should rather be called, hardened glass, are almost as easily broken as ordinary glass. Objects such as tumblers, when allowed to fall, nearly always break if they strike the floor on the lip or mouth. Still, there is no doubt that most glass treated by this process will stand a great deal of rough usage, and that some examples are practically unbreakable. In the case of window-glass, there is the disadvantage that a diamond will not cut it, and no variety of glass so hardened can be safely engraved or 'cut,' because when the tool penetrates much below the skin the glass falls to pieces—almost to dust. This is a difficulty which has baffled not only M. de la Bastie, but all other producers of the hardened article. These defects, as well as the high price of toughened glass, have as yet prevented its coming into extensive use.

In 1885 Mr Frederick Siemens produced three kinds of 'tempered glass,' of very homogeneous character and of great strength and hardness, by means of his regenerative gas-radiating furnace. 'Press-hardened glass' is that which, after being cut into the proposed shape, is softened in the radiation furnace, and then placed between cold metal plates. It may thus be so rapidly cooled that the diamond will not touch it.

Colouring of Glass.—Any kind of glass can be coloured by metallic oxides, and the chief colours given by these are noted in the following list. *Crimson* of various shades, from gold, 'Purple of Cassius' (a compound of gold and tin) being the compound generally used. So small a quantity as $\frac{1}{1\,0\,0\,0\,0\,0\,0}$th part of gold imparts a rose colour to glass. A red colour is also got from protoxide of copper. *Purple* or *violet red* is obtained from peroxide of manganese. *Blue* from oxide of cobalt or oxide of copper, but chiefly from the former. *Green* from the same oxides, together with sesquioxide of iron; a fine green is likewise got from sesquioxide of chromium. *Yellow* from oxide of antimony or sesquioxide of iron; sometimes from carbon. Sesquioxide of uranium gives a beautiful opalescent-yellow with a greenish cast. Chloride of silver is used to stain glass yellow. Arsenious acid produces an opaque *white;* so also does the mineral Cryolite (q.v.), as well as aluminate of soda. Aventurine glass is a beautiful material of a brownish-red colour, with gold-like spangles, in imitation of Aventurine (q.v.) quartz. It is largely used in the ornamental glass made at Venice.

Coloured glass is made in several ways. When the colour is all through the body, the glass consists of *pot-metal;* but for some purposes, and especially when the colouring material is expensive, it is

flashed—i.e. a thin veneer of colour coats a greater thickness of clear glass. In this case the two layers are 'gathered' from different pots on the blowing-iron, and blown out together as one sheet. Sometimes a very thin coloured coating is put on clear glass by spreading, say, a red glassy powder on the surface of the latter, and then carefully fusing it. When the chloride or other salt of silver is used to give a yellow, orange, or red, the glass is merely *stained* on the surface. In painted glass the decoration is usually produced by the use of enamel colours painted on with a brush, and afterwards fired at a moderate heat. Single sheets of glass, each with several shades of the same colour, are now made for glass-stainers, by which much shading by hand is dispensed with. A pane or vessel of flashed glass may be ornamented by partially removing the coloured layer, either by cutting or etching; and in the case of many designs additional enamel colours are added. Hydrofluoric acid, which corrodes glass, is commonly used to produce etched patterns upon it, by protecting certain portions with a varnish, and allowing the acid to act upon the unprotected parts. For painted windows, see GLASS (PAINTED); and for artificial gems of glass, see STONES (PRECIOUS).

The beautiful *iridescence* of much very ancient glass is known to be due to the partial decomposition of its surface and the formation of innumerable thin scales. Many attempts have been made to produce a like result artificially, and several methods have been successful. One is to submit the object to the influence of acid solutions, with the help of heat and pressure.

Venice, which prior to 1859 produced almost nothing in glass but beads, now, thanks to Salviati (q.v.), is once more making on a large scale glass objects, whose quaint forms and rich colours are but little, if at all, inferior to the best products of her ancient glass-houses. The well-known Bohemian glass, much of which is coloured and gilt, but which in past days was often more showy than tasteful, has recently shown quite remarkable advances in the character of its decoration. Some very tastefully ornamented coloured glass is also made in France.

Glass cutting and Engraving. It is usually flint-glass that is so treated; and vessels intended to have cut patterns are blown with thick walls. The first operation in glass-cutting is usually done on an iron grinding-wheel 10 or 12 inches in diameter, and about three-fourths of an inch thick, which is made to revolve vertically by means of a belt and pulley. Immediately above a hopper-shaped cistern is placed, which supplies the wheel with the necessary mixture of sand and water. If a faceted pattern is to be given to a decanter or other object, it is first roughed out on this wheel by the grinder holding the vessel against it. The facets now formed on the glass are next made smoother by a fine sandstone wheel, fed with water only, and similarly driven. For many purposes this wheel is of an angular section on the edge. The ground parts are finally polished upon a wooden wheel, supplied with moist putty-powder (oxide of tin) or other fine polishing material. The obscuring of glass by the ordinary process is done with sand and water alone; but much of this kind of work is now done by Tilghman's sand-blast process, to be presently noticed. Engraved patterns are produced by means of small copper discs, revolving in a lathe, emery powder, mixed with oil, being applied to the edges of their circumference. We have already referred to the use of hydrofluoric acid for etching glass.

Tilghman's Sand blast.—This is a very striking invention. The well-known fact that windows exposed to the action of wind-blown sand by the seashore eventually become completely obscured appears to have suggested the process to Mr Tilghman. The Matthewson's patent sand-blast apparatus, manufactured by the Tilghman's Patent Sand-blast Company, is altogether independent of any blower or engine, and occupies a very small space, being about 2 feet square and 3½ feet high. The piece of glass to be operated on is held on the top of the machine. The sand is set in motion by a steam ejector (part of the machine), being drawn by the vacuum caused by the flow of steam into an annular space where it mingles with the steam, and is ejected through a small pipe against the glass. The machine does exceedingly fine and quick work as regards obscuring both plain and flashed glass. It cuts away the flashed surface almost as soon as the glass is held in position. The parts which are to remain bright are protected either by a composition or by blotting-paper, which, having been soaked in glycerine and glue, has been stuck on to the glass, and from which the pattern is cut out. The blast will drill holes in a glass plate ¼-inch thick of a diameter from ¼-inch to 1 inch in less than two minutes. This machine is not adapted for obscuring large sheets of glass, which is accomplished by a machine in which the sand is set in motion by a Baker's blower driven by a non-condensing engine. The latter apparatus is not capable of perforating glass or of removing the flashed surface.

Pressed Glass.—By this name is known a certain cheap class of objects, such as tumblers, small dishes, &c., with patterns in imitation of cut glass. It is an American invention, and the process consists in pressing or shaping glass into form by means of a metal mould and reverse, called a plunger, or, for larger work, by a weighted lever, or a screw and fly-wheel. The chief seat of this branch of the trade in Great Britain is at Newcastle-on-Tyne, where a glass in which baryta is largely or wholly substituted for lead is used. By a somewhat similar but much older process, 'pinched glass' objects such as buttons are largely made at Birmingham.

Soluble Glass.—When silica (flint or sand) is fused with an excess of akali, a glass is formed which is slowly soluble in cold, but readily soluble in hot water if powdered. The soluble silicate of soda or of potash formed by this or by other methods is known as soluble glass or water-glass. When pure and solid it has the appearance of common glass, and it is the more soluble the larger the quantity of alkali that it contains. This substance has a number of applications in the arts. When a solution of it is mixed with sand, ground chalk, dolomite, or other minerals, it gradually binds them into a stony mass. See STONE (ARTIFICIAL). It is also employed as a Cement (q.v.). Soluble glass is useful as a material for rendering calico and even wood non-inflammable, for improving the cleansing power of cheap soaps, and as a dung substitute in dyeing. A small quantity of silicate of soda mixed with hard water improves it for washing purposes.

As far back as 1825 Fuchs of Munich suggested the application of soluble glass to the surface of fresco-painting, in order to fix the colours, the climate of northern Europe not being suitable for the preservation of this kind of decoration, when simply executed in the old way, with colours applied with water on a plaster ground. It has frequently been stated that Fuchs's plan of applying solutions of silicate of soda or silicate of potash to fresco-painting has effectually preserved it. But in most cases it has not done so. The action of the carbonic acid of the atmosphere upon either of these compounds has usually, in the course of time, brought out an efflorescence like mildew on the surface of the picture. Professor Barff, who has paid a good deal of attention to the behaviour of

these soluble silicates, asserts, in an essay written in 1876, that if, instead of silicate of soda or silicate of potash, a solution of aluminate and silicate of potash be used with the fresco colours on a properly prepared ground there is no fear of the surface decaying, and adds that paintings executed in this way have stood for many years. The plaster-ground should consist of sand and lime, but no plaster of Paris should be mixed with it.

The name *Volcanic Glass* is not infrequently given to Obsidian (q.v.), as also to vitreous lava, and even to a kind of pitchstone.

See Neri, *Ars Vitraria* (Amsterdam, 1668); Pellat, *Curiosities of Glass-making* (1849); Sauzay, *Marvels of Glass-making* (1860); Pelgot, *Le Verre, son Histoire, sa Fabrication* (1877); Nesbit, *Glass South Kensington Museum Art Handbook* (1878); Froehner, *La Verrerie Antique* (1879); Gerner, *Die Glas Fabrikation* (1880); Chance, *Treatise on Crown and Sheet Glass* (1883 ; M. A. Wallace Dunlop, *Glass in the Old World* (1883); Gerspach, *L'Art de la Verrerie* (1885).

Glass. PAINTED or STAINED. There are two kinds of painted glass known in modern times, Enamel and Mosaic glass. In enamel glass proper certain fusible pigments are painted on a sheet of white glass, which is then fired, and the result is a picture the tints of which even in the high lights are not wholly transparent. A modification of this method produces its picture partly by enamelling on white glass, partly by the use of pot-metal glass (i.e. glass coloured while in a state of fusion, and therefore of the same tint all through), the colour of which is heightened or modified by the use of enamels. In this style, if any junction between two pieces of glass becomes necessary, the lead calms used for the purpose are studiously concealed by being made to run along leading lines of drapery or other forms in the picture. The object of this enamel and semi-enamel glass-painting is the closest possible imitation of an oil or water-colour picture; and the results of it are never satisfactory. For at the best it can only do with difficulty and imperfectly what the oil-painting does with ease and perfection; while at the same time it refuses to avail itself of the special characteristics of glass, which can produce effects that no opaque painting can approach. This imitation of easel or wall pictures also leads the designer into making designs unfitted for the ornament of windows, and wandering from their true purpose of decoration. Indeed, not infrequently the work of a great master in picture-painting is taken as a model for a stained-glass window, and laboriously and servilely imitated, with the result that a mere caricature of the great work is produced, which is as far as possible from being an 'ornament' to the building in which it is placed.

The only method capable of producing stained glass which shall be beautiful and interesting, and which at the same time can plead some reason for its existence, is that which has been called mosaic glass, the process of which very briefly stated is as follows:

A design is made wherein the drawing is given and the colours indicated, which is the working-drawing of the glass-painter. From this working-drawing a kind of map is made which gives all the various pieces of the mosaic. The glazier cuts these pieces out from sheets of glass of various colours, and hands them back to the painter, who proceeds first to paint the leading lines with a solid opaque enamel, the colouring matter of which is an oxide of iron. This being done (and the glass sometimes having been fired at once, but sometimes not), the pieces of glass are stuck together temporarily (by means of wax) on a glass easel, and the painter slightly shades his bold traced lines with the same opaque colour; using sometimes washes (in which case, of course, the colour is much diluted, and is only semi-opaque), and sometimes hatching of lightly laid-on lines, as in a black and white drawing on paper. Sometimes both washes and hatching are used, and sometimes the washed shadows are 'stippled'—i.e. part of the colour is removed by dabbing it with the end of a broad brush. In any case the object of the methods of shading is to keep the shadows as clear, and to dull the glass as little as the *explanation* or *expression* of the subject will admit of. Two or three or more firings are necessary during the process of this painting, but as far as the painting as distinguished from the mosaic is concerned this is all that has to be done, though it must be said that to do it well requires considerable experience and artistic skill and feeling.

This painting being done, the glass goes back to the glazier's bench again, and he 'leads it up' (i.e. joins it together with lead calms soldered at the junction), and the window, after having been solidified by a stiff cement or putty rubbed into the leaf of the leads, has then only to be put in its place and strengthened by the due iron stay-bars. It may be mentioned here that in this mosaic glass-painting, so far from there being any necessity for concealing the 'leads,' it is highly desirable to break up the surface of the work by means of them, always taking care that their direction is carefully considered from the point of view of their appearance. The obvious strength which the network of leads gives to the window on the one hand, and the obvious necessity for picking out small pieces of exquisite colour on the other, take away all sense of discomfort in the arbitrary disposition of these constructive lines.

A mosaic stained-glass window, therefore, seems a very simple affair, and so it is as a process (bating some difficulties in the making of the material). Its real difficulties are all on the artistic side, and have to do with the qualities of design and the choice of material.

As to the design, it must be repeated that *suggestion*, not *imitation*, of form is the thing to be aimed at. Again, the shading is, as above said, for the sake of explanation, not to make the work look round, and also for diversifying the surface of the glass, to make it look rich in colour and full of detail. The qualities needed in the design, therefore, are beauty and character of outline; exquisite, clear, precise drawing of incident, such especially as the folds of drapery. The whole design should be full of clear, crisp, easily-read incident. Vagueness and blur are more out of place here than in any other form of art; and academical emptiness is as great a fault as these. Whatever key of colour may be chosen, the colour should always be clear, bright, and emphatic. Any artist who has no liking for *bright* colour had better hold his hand from stained-glass designing.

Consideration of the colour of the work naturally leads to consideration of the material. The ordinary machine-made window-glass, thin, and without any variety of surface, is wholly unfit for stained glass, but it should be stated in passing that a modern mechanical imitation of the unevenness of surface found in old glass, which is commonly called 'cathedral glass,' is the worst of all materials for windows, and should never be used in any kind of glazing, ornamental or plain. The due varieties of surface are those that occur *naturally* in the process of making thick cylinder or crown glass. All glass used for glass-painting should be very thick, or, whatever the pigments used for colouring may be, the effect will be poor, starved, and, if bright colours be used, glaring. The glass which has to show as white should, when laid on a sheet of white paper, be of a yellowish-green colour; for the colours in stained glass are so powerful that

unless the whites are toned in the material itself they will always be inharmonious and cold.

It is necessary in addition to state briefly what the varieties of coloured glass proper for the purpose are. First comes pot-metal, in which the colour is an integral part of the glass; then flashed-glass, where the colour forms a coloured skin to a white body;* and lastly a transparent yellow stain (deduced from silver), which attacks the silica, and thus forms a part of the glass, is much used to colour portions of the pot-metal, for ornaments on dresses, hair, flowers, and the like.

This art of mosaic window-glass is especially an art of the middle ages; there is no essential difference between its processes as now carried on and those of the 12th century; any departure from the medieval method of production in this art will only lead us astray. It may be added that its true home was northern Europe during the middle ages, as the importance of the wall-pictures in Italy made its fullest development less necessary to the buildings in that country, and accordingly the Italians did not understand its principles so well as the artists of France and England, and had not the full measure of unerring instinct which the latter had. And besides, as Gothic architecture lasted longer with us and the French, there was more opportunity for the development of the later styles here, since the neoclassic architecture had scarcely a place for stained glass.

The 12th century begins the real history of the art. The windows of that date that are left us are very deep and rich in colour, red and blue being the prevailing tints. They are mostly figure designs, disposed in ornamental frames, and are admirably designed for their purpose; the painting is very simple, nothing but a little washed shading supporting the traced lines; the figures are usually small, except in the case of windows far removed from the eye, as in some of the windows at St Denis near Paris. The beautiful windows in the choir aisles at Canterbury Cathedral are usually referred to the 12th century, but if they belong to it they must be of its later years.

There was a slow development of the glass all through the earlier years of the 13th century, and a great deal more work is left us of that period; a great deal of the glazing of the early pointed architecture was of mere geometrical work. The ignorant architect, Wyatt, who gutted Salisbury Cathedral in 1790, found most of the windows so glazed, and destroyed the glazing except for a few fragments. The window of the north transept at York Minster, now called the 'Five Sisters,' is a well-known example of this beautiful work.

The 14th or end of the 13th century invented a very beautiful kind of glazing especially suitable to the large traceried windows then coming into vogue; in this style bands of very richly coloured figure-glass, usually framed in canopies, run across the lights, and are supported by ingenious fret-glazing in white, on which elegant running patterns are freely drawn, and this grisaille (as it is called) is connected with the richer-coloured bands by means of borders, and with medallions, little gem-like pieces all carefully patterned; the whole producing an effect of singular elegance and richness, and admitting plenty of light. The nave aisles of York Minster and Merton College Chapel at Oxford may be cited as giving us very perfect specimens of this glazing, which may be said to be the highest point reached by the art.

With the change to the Perpendicular style in the 15th century came a corresponding change in stained glass, though, of course, that change was very gradual. The glass now had a tendency to become paler in colour; a great part of the great traceried windows of the style was oftenest made up of elaborate canopies, in which white touched with yellow stain played a great part. Some very beautiful windows of this date are almost entirely carried out in silvery whites and yellow stains. The shading of the figures and drapery, &c. was much more elaborate; the stippling and hatching above mentioned was common, especially in the later part of the style; but the luminous quality of the shadows was generally well maintained. In spite of the ravages of the Puritans both of the Reformation and of the Cromwellian episodes, examples of stained glass, usually very fragmentary, are common throughout England. The antechapel at New College, Oxford, the great east window of Gloucester cathedral, many windows in the choir of York Minster, and many of the parish churches in that city, notably All Saints, North Street, are splendid examples of the work of this period.

In the 16th century the art was on the wane: it became heavier in shading, less beautiful in colour, and aimed too much at pictorial effect. As a reasonable art stained glass can hardly be said to have existed after about 1540; a few pieces of rather pretty and fanciful glazing and a little heraldic work are in the Elizabethan period all that represent the splendid art which adorned such buildings as York Minster and Canterbury Cathedral. The windows of Fairford Church, in Gloucestershire, form a very interesting collection of the work of the earlier part of the century. King's College Chapel at Cambridge is almost entirely glazed with picture-work of this period. It has suffered much from reglazing, and is now very hard to read: nor could the art in it have ever been of a very high order.

With the ruin of Gothic architecture stained glass was swept away entirely; and indeed it perished sooner and more completely than any of the other subsidiary arts, doubtless because its successful practice depends more on the instinctive understanding of the true principles of decorative art than any other of the arts connected with architecture.

The art of glass-painting has been revived with the eclectic revival of Gothic architecture, which is such a curious feature of our epoch, and has shared to the full in the difficulties which an eclectic style must of necessity meet with. Still it must be understood that glass-painting is no 'lost art' in the sense of its processes being forgotten: whatever the deficiencies of the modern art may be, they are the result of the lack of feeling for decoration, rather than of difficulties as to material, workshop receipts, and the like. The very praiseworthy studies of Mr Winston and his collaboration with Messrs Powell of Whitefriars in the manufacture of window-glass fit for the purpose made it possible for us many years ago to produce good stained-glass windows if our artistic powers did not fail us, or rather if they could be turned into the right direction; if the designers could understand that they should not attempt to design pictures but rather pieces of ornamental glazing which, while decorating the buildings of which they formed a part, should also tell stories in a simple straightforward manner.

This they have in a great measure learned to understand, and the public also are beginning to see that the picture-window of the semi-enamel style (as represented chiefly by the elaborate futilities produced by the Munich manufactories) cannot form, as a window should do, a part of the architecture of the building. On the other hand, there has been (unavoidably doubtless) too much

* Flashed-glass is mostly used for the beautiful 'ruby' glass deduced from copper, the making of which was revived by Messrs Powell of Whitefriars, in London, with the help of Mr Winston about the year 1853.

mere copying of medieval designs; it has been forgotten that the naivetés of drawing of an early stage of art which are interesting when genuine and obviously belonging to their own period, become ridiculous when imitated in an epoch which demands at least plausibility of drawing from its artists. But that very demand for plausibility and the ease of its attainment form another snare for the stained-glass designer, whose designs, though made with a knowledge of the requirements of the art, and though not actually imitative of medieval work, are too often vacant and feelingless, mere characterless diagrams, rather than the expression of thought and emotion, as the work of the middle ages always was in spite of any rudeness of drawing or shortcoming in knowledge.

One drawback to the effectiveness of painted windows comes from the too common absence of any general plan for the glazing of the building. The donors of windows are allowed to insert whatever may please their individual tastes without regard to the rest of the glazing or the architectural requirements of the building; so that even where the window is good in itself, it fails in effect of decoration, and injures, or is injured, by its neighbours. The custodians of buildings before they allow any window to be put up should have some good plan of glazing schemed out embracing a system of subjects, an architectural arrangement, and a scheme of proportion of colour, and this plan should be carefully adhered to. Thus, one window would help the other, and even inferiority of design in one or two of the windows would be less noticed when the whole effect was pleasing. The gain of such a careful arrangement is sufficiently obvious in cases where the ancient glazing of a church is left intact; as, for instance, in the beautiful church of St Urbain at Troyes, a work of the end of the 13th century, and whose glazing is perhaps the most satisfactory example of glass painting.

The worth of stained glass must mainly depend on the genuineness and spontaneity of the architecture it decorates: if that architecture is less than good, the stained-glass windows in it become a mere congeries of designs without unity of purpose, even though each one may be good in itself.

See works by Winston (1847 and 1865), Warrington (1848), F. Miller (1885), and especially Westlake, *A History of Design in Painted Glass* (4 vols. 1879-95).

Glass-crabs (*Phyllosoma*), the larval forms of rock lobsters, &c. (Palinuridæ), formerly regarded as adults, and made into a genus or family. The body consists of two transparent leaf-like discs; there are beautiful eyes on long stalks.

Glasse, HANNAH, was the author of the famous *Art of Cookery* (1747); as also of *The Compleat Confectioner* (1770), and of *The Servant's Directory* (1770). The proverb 'First catch your hare' does not expressly occur in her *Cookery*.

Glass-houses. See PLANT-HOUSES.

Glassites (properly *Glasites*), a religious body popularly so named from John Glas (1695–1773), some time parish minister at Tealing, near Dundee. In 1730, after three years of inquiry, Glas was deposed by the General Assembly of the Kirk of Scotland for opinions set forth in *The Testimony of the King of Martyrs concerning His Kingdom* (John, xviii. 36, 37), that National Church establishments are unscriptural and anti-christian in doctrine and persecuting in spirit, and that a congregation of believers in church order (i.e. with bishops or elders, and deacons) is subject to no jurisdiction under heaven. Glas and those who adhered to him formed a congregation, and other churches were formed in Scotland, England, and America. Out of Scotland the brethren were called *Sandemanians*, from Robert Sandeman (1718-71), son-in-law to Glas, who helped in the work, and died at Danbury in Connecticut. The doctrines professed are taken literally from Scripture. Salvation through grace and by the work finished by our Lord upon the Cross, the helplessness of sinful men to aid in their own salvation, and the necessity for works as evidences of living faith sum up their doctrine. They consider the celebration of the Lord's Supper as the chief purpose of the Sabbath assembly, all else being subordinate to this. The Lord's Prayer is used to begin and end the service, prayers in which the brethren take part in turn, praise in which the Psalms alone are used and the stated reading of the whole Scripture, form parts of the service, exhortation by the elders following. Before the ordinance the 'fellowship' is observed, this being a collection for the necessities of poor members. Bishops or elders are chosen by the marks given in 1 Tim. iii. 1–7, &c., and a plurality of elders is required for the ordinance and for acts of discipline. Deacons and deaconesses have care of the poor and of all secular affairs of the church. All services to the church are given free as from love to the truth. Love feasts are held at mid-day on Sabbath, at which all members not *necessarily* absent attend. The baptism of members and their children is practised. The law of discipline (Matt. xviii. 15–17) is strictly observed as a means of preserving peace and unity in the church, while eating of blood, the use of oaths as between brethren, the use of the lot for frivolous purposes, and the covetous accumulation of riches are forbidden. The kiss of charity and services of kindness are enjoined. The brethren take no part in worship with any not accepting those scriptural doctrines.

Glass Paper or **Cloth,** for polishing woodwork, is made by sprinkling powdered glass over paper or calico still wet with a coat of thin glue.

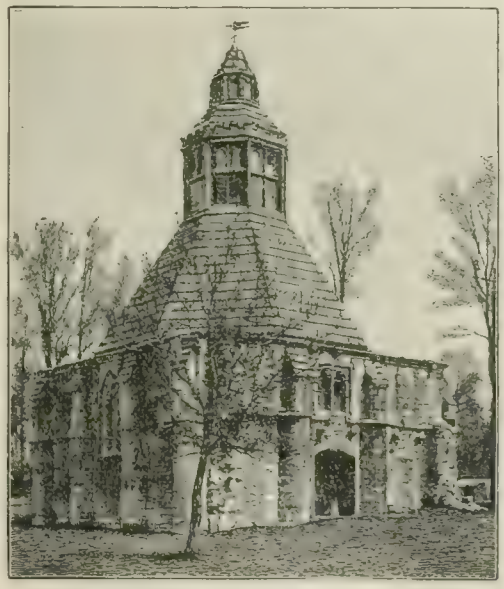
Glass-rope Sponge (*Hyalonema*), a Japanese flinty sponge (one of the Hexactinellida), the body of which is anchored in the mud or ooze by a spirally twisted wisp or rope of siliceous threads. The latter, stripped of the sponge and manipulated by the Japanese divers, is a common curiosity. See SPONGES.

Hyalonema.

Glass-snake (*Ophisaurus ventralis*), a limbless serpent-like lizard (belonging to the short tongued section) common in North America from Virginia to Florida. It is about 3 feet long, and varies greatly in colour. The joints of the tail break off readily on irritation, but are soon reproduced. The glass-snake feeds on worms, insects, mice, &c., chooses dry regions, and spends much of its time in holes under ground. Only the above species is known, but a closely-allied genus (Pseudopus) occurs in southern Europe and Assam.

Glasswort (*Salicornia*), a genus of Chenopodiaceæ of which one species (*S. herbacea*), a leafless plant with jointed stems, is common in salt-marshes in Britain. It makes a good pickle or antiscorbutic salad. Several species grow abundantly on the shores of the Mediterranean, and, as they contain a large quantity of soda, were formerly of importance in making *barilla*, along with the species of Saltwort (q.v.).

Glastonbury, an ancient municipal borough of Somersetshire, lies, engirt by the river Brue, amid orchards and level pastures—once fen-land—at the foot of the conical tower-crowned Tor (500 feet), 6 miles by rail SSW. of Wells, and 36 S. of Bristol. The Celtic *Ynysvitrin*, the *Avalon* of Arthurian legend, and the *Glæstingaburh* or Glæstings' borough of the West Saxons, it was hither, says William of Malmesbury, that Joseph of Arimathea came bearing the Holy Grail, here that he founded the first Christian church in Britain. On Weary-all Hill he planted his pilgrim's staff; it took root, and grew into the Holy Thorn, which blossomed miraculously every Old Christmas-eve until it was cut down by a Puritan. [Grafts from it flourish still; one at Sutton Poyntz, near Weymouth, duly blossomed on the night of the 5th January 1884 in presence of 250 persons. It is the *Cratægus præcox* of botanists.] Certain at least it is that, unlike Canterbury or York or London, 'Glastonbury was the one church of the first rank in England which stood as a memorial of British days, the only one which had lived unscathed through the storm of English conquest.' For the wattled basilica, which contained the grave of a St Patrick and of Gildas, was in 630 encased by Paulinus of York in boards and lead; and to the east of it in 719 King Ine reared the great church of SS. Peter and Paul.



The Abbot's Kitchen, Glastonbury.

This, spoiled by the Danes, was the abbey refounded by St Dunstan (q.v.) about 946, and became the sepulchre of Kings Edmund, Edgar, and Edmund Ironside, if not indeed of Dunstan himself, of Joseph of Arimathea, or of Arthur and Guinevere. It had just been rebuilt when in 1184 the whole pile was consumed by fire; and the splendid minster, 528 feet long, then undertaken by Henry II., was not dedicated till 1303. In 1539 Richard Whiting, the last of its mitred abbots, was hanged on the Tor by Henry VIII.; and the ruins of this great Benedictine house, which had covered 60 acres, are now comparatively scanty, having long been the quarry of the district. Yet still on the site of the 'Vetusta Ecclesia' stands the roofless chapel of Our Lady or St Joseph, a fine example of Transition Norman, with its 15th-century crypt; still there is the massive stone Abbot's Kitchen (14th century), 33½ feet square, and 72 high, with its four huge fireplaces and pyramidal roof. Apart from its abbey and its two parish churches, one of which has a noble tower 140 feet high, Glastonbury is a quaint, old-world place, a very store of domestic antiquities, with the 15th-century Pilgrims' Inn (now the 'George'), the Tribunal, and the Abbot's Barn. Sharpham, 2 miles south-west, was Fielding's birthplace. Sheepskins, mats, rugs, gloves, and pottery are manufactured. Pop. (1851) 3325; (1891) 4119. A lake-dwelling was uncovered here in 1895. See GRAIL, ARTHUR; the Rev. R. Willis's *Architectural History of Glastonbury Abbey* (1866); Freeman's *English Towns and Districts* (1883); Gasquet, *The Last Abbot of Glastonbury* (1895).

Glatigny, ALFRED, a 15th-century French strolling-player, who died young, having written poems somewhat like those of Villon.

Glatz (Czech *Kladsko*), a manufacturing town of Prussian Silesia, situated between two fortified hills, on the Neisse, 58 miles by rail SSW. of Breslau. Pop. (1875) 12,553; (1895) 14,151. During the Thirty Years' and the Seven Years' Wars Glatz was frequently taken.

Glauber, JOHANN RUDOLPH, a German alchemist and physician, was born at Karlstadt, in Franconia, in 1603 or 1604, and died at Amsterdam in 1668. No details regarding his life are known, except that he resided at Vienna, Salzburg, Frankfort-on-the-Main, and Cologne, from whence in 1648 he removed probably to Amsterdam. Although a believer in the philosopher's stone and in the elixir vitæ, he contributed very materially to the progress of chemistry. In 1648 he discovered hydrochloric acid whilst experimenting with oil of vitriol and common salt; he was probably the first to procure nitric acid; and his name has been transmitted in Glauber's Salt, which he likewise discovered. His treatises were published at Amsterdam in 7 vols., 1661; and an English translation was printed by Packe at London in 1689.

GLAUBER'S SALT is the popular name of the neutral sulphate of soda whose chemical composition is represented by the formula $Na_2SO_4 + 10H_2O$. It occurs in long four-sided translucent prisms, terminated by dihedral summits, and containing ten atoms of water. On exposure to the air, the crystals lose all their water, and become resolved into a white powder. When heated they readily melt in their water of crystallisation; and, if the heat is sufficiently continued, the whole of the water is expelled, and the anhydrous salt remains. Glauber's salt has a cooling, bitter, and saltish taste; it is readily soluble in water; its solubility (in the ordinary crystalline form) increasing up to 92°, when it appears to undergo a molecular change, and to be converted into the anhydrous salt, which at this temperature is less soluble than the hydrated compound, and separates in minute crystals. Glauber's salt is a constituent of many mineral waters (as at Carlsbad and Cheltenham), and is found also as an efflorescence about saline lakes in some parts of the United States; and it occurs in small quantity in the blood and other animal fluids.

The anhydrous salt is prepared in enormous

quantity from common salt and oil of vitriol, with the view of being afterwards converted into carbonate of soda (see SODA). For medical use a purer form is required. The salt which remains after the distillation of hydrochloric acid—this salt being sulphate of soda contaminated with free sulphuric acid—is dissolved in water, to which is added powdered white marble (carbonate of lime), to neutralise the free acid, and to precipitate it as an insoluble sulphate; the solution is boiled down till a pellicle appears, is strained, and set aside to crystallise.

It is used as a common purgative, and is especially applicable in fevers and inflammatory affections, when it is necessary to evacuate the bowels without increasing or exciting febrile disturbance. The usual dose is from half an ounce to an ounce; but if it is previously dried, so as to expel the water of crystallisation, it becomes doubly efficient as a purgative. It is now much less frequently used in domestic medicine than formerly, having given place to milder aperients.

Glauchau, the second in rank of the manufacturing towns of the kingdom of Saxony, is picturesquely situated on the right bank of the Mulde, 20 miles W. of Chemnitz by rail. The town is the centre of the woollen-weaving industry, woollen goods to the value of £2,000,000 being exported annually. There are also dye-works, print-works, iron-foundries, and carpet, paper, and machine factories. Pop. (1834) 6292; (1900) 24,500. See Eckardt, *Chronik von Glauchau* (Glau. 1880-81).

Glaucoma (Gr. *glaukos*, 'sea-green,' on account of a greenish colour sometimes seen in the pupil), a disease of the Eye (q.v.).

Glaucus, the name of several figures in Greek mythology. (1) Son of Hippolochus and grandson of Bellerophontes, commander of the Lycians in the Trojan war, slain by Ajax. He was connected with Diomedes by ties of hospitality, and when they met in battle they forbore to fight with one another, exchanging arms instead.—(2) Son of Minos of Crete and Pasiphae, smothered when a boy by falling into a cask of honey. The soothsayer, Polyidus of Argos, unable to bring him back to life, was buried with him, but saved by a serpent which revealed a herb effective for the purpose.—(3) A fisherman of Anthedon in Boeotia, who became a sea-god by eating part of a herb which Cronos had sown. Every year he visited all the coasts of Greece, attended by a train of marine monsters, and giving forth oracles to which it behoved fishermen and mariners especially to attend.

Glaucus, a genus of nudibranch Gasteropods, inhabiting the warmer parts of the Atlantic and Pacific oceans. The body is long, slender, gelatinous, furnished with three pairs of lateral outgrowths with numerous fine processes. The mouth has the usual horny jaws, adapted for preying on other small marine animals; the antennæ or 'horns' are inconspicuous. These small molluscs—about an inch and three-quarters long, of a blue colour, and extremely delicate and beautiful, float inertly with irregular movements of their slender appendages on the surface of the water. For the nature of the outgrowths, &c., see NUDIBRANCHS.

Glaucus atlanticus.

Glaux, a genus of Primulaceæ, without corolla. *G. maritima*, sometimes called Sea Milkwort and Black Saltwort, is common on muddy soils along sea-coasts of northern Europe. It was formerly used in soda-making. It is readily eaten by cattle, and is said to enhance the yield of milk from its succulent leaves. It is also pickled.

Sea Milkwort (*Glaux maritima*).

Glaze. See POTTERY.

Gleaning. In conformity with the positive command contained in the Mosaic law to leave the gleanings of the harvest to the poor and to the stranger (Lev. xix. 9 and xxiii. 22), there has been almost everywhere a popular feeling to the effect that the farmer was not entitled to prevent the poor from gathering what the reaper had left behind. In England the custom of gleaning had very nearly passed into a legal right, for in an extra-judicial dictum of Lord Hale it is said that those who enter a field for this purpose are not guilty of trespass, and Blackstone seems disposed to adopt his opinion; but the Court of Common Pleas has since decided that the public cannot claim the privilege as a right. The custom still exists in England, though it is often restricted to the wives and children of the harvesters. In Scotland the law has decided that the poor possess no right to glean, and that the farmer may exclude them from his fields.

Glebæ Adscripti (Lat., 'attached to the soil') from the 4th century onwards were in the Roman empire the cultivators of the soil, who, though personally free, were inseparably attached to the land they cultivated. They paid a fixed rent in kind to the owner of the domain, and, when he retained any land in his own hands, they were generally under the obligation to render him free a determinate amount of labour to till it. If the land was sold, they still remained attached to it. The Helots (q.v.) of Sparta were also *glebæ adscripti*.

Glebe (Lat. *gleba*, 'a clod or lump of earth'), the land belonging to an ecclesiastical benefice, or from which the revenues of the benefice arise. The assignment of glebe-lands was formerly held to be of such absolute necessity that without them no church could be regularly consecrated. The fee-simple of the glebe is held by the law of England to be in *abeyance*—that is to say, without an owner, in contemplation of law; but after induction the freehold of the glebe is in the parson, and he possesses most of the powers of a proprietor, with the exception of the power of alienation. The quantity of land to be assigned is not fixed by any general rule of law; and the glebe-lands of the parochial clergy vary considerably in extent. Previous to the Reformation the clergy possessed certain powers of alienation at common law; and if a bishop with the assent of his chapter, or an abbot with the assent of his convent, or the like, alienated glebe-lands, the deed would not have been void, because the fee-simple was in the holder of the benefice for the time being; but by 1 Eliz. chap. 19, and other statutes of the same reign, all grants, feoffments, conveyances or other estates shall be utterly void and of none effect, notwithstanding any consent or confirmation whatsoever. Subsequent statutes prescribe and regulate the modes in which glebe-lands may be dealt with. Power has been given to

exchange glebe houses and lands; and by the Tithe Commutation Act (1836) the Tithe Commissioners (since 1882 Land Commissioners) were empowered to ascertain and define the boundaries of the glebe-lands of any benefice, and also, with consent of the ordinary and patron, to exchange the glebe-lands for other lands within the same or any adjoining parish, or otherwise conveniently situated. The subsequent Act 17 and 18 Vict. chap. 84 moreover provides that the incumbent of any benefice entitled to glebe shall, with such consents as are specified in the act, be entitled to annex such glebe or other lands by deed to any church or chapel within the parish, district, or place wherein such glebe or land is situate. Glebe-lands are exempt from tithe; they are also excepted out of the acts which forbid the beneficed clergy to engage in agriculture and trade. If an incumbent dies after sowing his glebe-land his personal representative is entitled to the crop. The Glebe Lands Act (1888) provides facilities for the sale of glebe with the approval of the Land Commissioners. See Phillimore's *Ecclesiastical Law*.

Glebe in Scotland.—In Scotland, as in England, a glebe forms, as a general rule, a portion of every ecclesiastical benefice of the Established Church, and is thus an addition to the stipend, and sometimes a very important one. Ministers in royal burghs, however, cannot claim glebes, unless in cases where there is a landward district attached to the parish. Even then, if there are two ministers, only the first can claim a glebe. Where parishes are disjoined, or separated into two portions, moreover, it does not necessarily follow that the portion erected into a new parish shall contain a glebe. By 5 Geo. IV. chap. 72, provision is made for payment of compensation out of the public revenue, in lieu of manse and glebe, to ministers whose stipends do not exceed £200. If there are arable lands, the glebe must not be less than four acres. If there is no arable land, the minister is entitled to sixteen *soums* of grass adjacent to the church. A soum is as much as will pasture ten sheep or one cow, so that the actual extent varies with the richness of the soil and consequent quality of the pasture. The presbytery possesses the power of designing glebes, the heritor from whose property the glebe is designed having recourse against the other heritors of the parish. By 1572, chap. 48, it is enacted that the glebe shall not be alienated by the incumbent. As the act limits its prohibition to such alienation as may be detrimental to the successor of the incumbent, it has been doubted whether the latter might not feu. The court, however, has been very unwilling to sanction this proceeding. When the church is changed, or transported, as it is called, to a new site, the court will authorise the sale or excambion of the glebe, but such excambions must be sanctioned by the presbytery. Where minerals are found on the glebe, they are worked under the superintendence of the heritors and presbytery for the behoof of the incumbent. Trees growing on the glebe are thought to belong to him. Glebe-lands are usually teind-free. See TEINDS.

Glee, a species of vocal composition peculiar to England, for three or more voices, and in one or more movements, generally unaccompanied and sung by male voices, though these conditions are not obligatory. It is distinguished from the madrigal by its modern tonality, larger number of musical motives, and a less extensive development of them; and in being written for single voices to each part. This last point, however, is now frequently disregarded. Its independent part-writing also distinguishes it from the modern part-song, which is usually in simple harmony, but the name is often given to such—e.g. Sir H. Bishop's 'Glees.' The glee flourished during the later half of the 18th century and the earlier part of the 19th. Samuel Webbe (1740–1816) is probably its greatest master. Among his best-known glees are 'When Winds breathe Soft' and 'Glorious Apollo,' the latter of which was always the first to be sung at the meetings of the now defunct Glee Club (1783–1857). Other writers of the first rank are R. J. S. Stevens (1757–1837), the composer of 'Ye Spotted Snakes,' 'The cloud-capt Towers,' and 'From Oberon in Fairyland;' John Wall Callcott (1766–1821), a most prolific composer, and author also of a well-known Grammar of Music, of whose glees 'The Red-cross Knight,' 'To all you Ladies,' and 'It was a Friar of Orders Grey,' may suffice as specimens; with whom may be mentioned the names of Horsley, Spofforth, Cooke, Paxton, Attwood, and Lord Mornington. See W. A. Barrett's *English Glees and Part-songs* (1886).

Gleet. See GONORRHŒA.

Gleig, GEORGE ROBERT, writer, born at Stirling, 20th April 1796, was the son of George Gleig, bishop of Brechin (1753–1840). He entered the army, and served in Spain (1813) and in America (1814). He subsequently (1820) took orders, and became inspector-general of military schools (1846–57), and chaplain-general of the army (1846–75). He deserves mention as the author of the story *The Subaltern* (1825), founded on incidents of the Peninsular war. He wrote several other novels, none equal to the first, and several volumes of military history and biography, as *Campaigns at Washington and New Orleans* (1847), Lives of Warren Hastings (1841), Clive (1848), and Wellington (1862), &c. He died 9th July 1888, near Winchfield, in Hampshire.

Gleim, JOHANN WILHELM LUDWIG, German poet, born at Ermsleben near Halberstadt, 2d April 1719, and died at Halberstadt on 18th February 1803. Besides writing a good deal of moderate poetry, he won for himself the affectionate appellative of 'Father Gleim,' on account of the encouragement and assistance he lent to the fledgling poets and poetasters of the day. But his efforts to encourage German literature, though sincere and well intentioned, were often the reverse of judicious and discriminating. His patriotic *Lieder eines Preussischen Grenadiers*, by their genuineness of feeling and force of expression, do rise above the general level of his other productions—odes in imitation of Horace and Anacreon, rhymed fables and romances, and songs. His collected works appeared at Halberstadt in 7 vols. in 1811–13, with a supplementary volume in 1841 (Leip.). See Körte, *Gleims Leben* (1811).

Gleiwitz, a town of Prussian Silesia, pleasantly situated on a small affluent of the Oder, 40 miles SE. of Oppeln, contains iron and other metal foundries, machine, glass, and iron works, &c. Pop. (1895) 24,980.

Glenalmond, a romantic valley of Perthshire, in Scotland, much visited for its scenery, and for Ossian's grave—the subject of Wordsworth's verses on the 'Narrow Glen.' It is the seat, 12 miles WNW. of Perth, of Trinity College, Glenalmond (1847; new buildings, 1891–94), a public school, whose buildings have been to some extent reproduced in those of Trinity College, Hartford, U.S.

Glencoe, a valley of northern Argyllshire, descending 7½ miles west-by-northward from a 'col,' 1011 feet high, to salt-water Loch Leven, 2 miles ENE. of Ballachulish. It is traversed by the Coe (or *Cona* of Ossian); and it is flanked by conical mountains, the Pap of Glencoe (2430 feet) the most prominent, Benveedan (3766) the loftiest. Of many descriptions of Glencoe the best are by Dorothy Wordsworth (1804); by Macaulay (1849),

who saw it both in rain and in sunshine, and calls it 'the very valley of the shadow of death;' and this by Charles Dickens (1844): 'Glencoe itself is perfectly *terrible*. The pass is an awful place. It is shut in on each side by enormous rocks, from which great torrents come rushing down in all directions. In amongst these rocks, on one side of the pass (the left as we came from Kingshouse), there are scores of glens high up, which form such haunts as you might imagine wandering in in the very height and madness of a fever. They will live in my dreams for years.'

In 1691 the Edinburgh authorities issued a proclamation exhorting the clans to submit to William and Mary, and offering pardon to all who before 31st December would swear to live peaceably under the government. All the chiefs submitted except M'Ian, the head of the Macdonalds of Glencoe, whose submission was delayed by unforeseen causes till 6th January 1692. The magistrate before whom he took the oath of allegiance transmitted a certificate to the Council at Edinburgh, explaining the circumstances of the case. However, on 16th January, King William signed an order, ending: 'If M'Ean of Glencoe and that trybe can be well separated from the rest, it will be a proper vindication of the public justice to extirpate that sect of thieves.' So on 1st February 120 soldiers—Campbells mostly, and commanded by Captain Campbell of Glenlyon—marched to Glencoe, and, telling the natives that they came as friends, and merely wanted quarters, for twelve days lived in the glen. Glenlyon, while visiting daily at the chief's house, employed himself in observing every pass by which escape was possible, and reported the result of his observations to Lieutenant-Colonel Hamilton, who was approaching from Fort-William with 400 more troops. The 13th was fixed for the massacre, and on the night of the 12th Glenlyon was supping and playing at cards with those whom he purposed to butcher. At five in the morning the murderous work began, and day broke on thirty-eight corpses, including those of at least one woman, an old man of seventy, and a boy of four. But, Hamilton not having come up in time, the passes were open, and some 150 men, and probably as many women, escaped—in many cases only to perish from cold and hunger among the snow in the high mountain-gorges. The huts were fired, and then the troops marched away, taking with them a thousand head of cattle and sheep and horses.

The prime movers of this deed of infamy were a Lowland statesman and a Highland chief, Sir John Dalrymple, Master (and afterwards Viscount and first Earl) of Stair, and John Campbell, Earl of Breadalbane. The one was actuated by chagrin at the failure of his scheme for pacifying the Highlands, the other by personal animosity. As for King William, Macaulay pleads that M'Ian's submission had been kept from him, that he knew the Macdonalds only as thieves and rebels, and that by 'extirpation' he certainly never meant them to be murdered in their sleep. Anyhow, a royal commission (1695) found that his instructions 'offered no warrant for the measure;' and there the affair ended. In 1884 a monument was erected to mark the scene of the massacre. See the histories of Macaulay and Hill Burton, and Paget's *Paradoxes and Puzzles* (1874).

Glencorse. See PENICUIK.

Glencroe, an Argyllshire glen descending 4¼ miles south-eastward to Loch Long, 2½ miles SW. of Arrochar. At its head is a stone seat inscribed 'Rest and be thankful.'

Glendalough, a valley in Wicklow county, 15 miles SW. of Bray, with fine scenery and remarkable ruins. It became a seat of religion with St Kevin in the 6th century; and some of the ruined 'seven churches,' as well as the round tower (110 feet high), may date from the 7th century.

Glendower, or GLENDWR, OWEN, a Welsh chief who headed the struggle of the Welsh for the recovery of their independence in the reign of Henry IV. of England, was descended from Llewelyn, the last Prince of Wales, and was born in Montgomeryshire about 1354. He was made esquire of the body to Richard II., and remained with him until his deposition by Henry IV. in 1399, after which he retired into private life. Shortly after the accession of the new king part of Glendower's lands were seized by his neighbour, Lord Grey of Ruthin. Thereupon the Welshman, being unable to obtain redress from the English king, took up arms in his own cause, and in 1400 seized the estates of Lord Grey. The king ordered his subjugation, and granted his estates to his brother, the Earl of Somerset. Then for two years Glendower carried on a guerilla warfare against the English marchers, backed up at times by the forces of Henry himself. In 1402 he drew Lord Grey into an ambush, and took him prisoner. In this same year Sir Edmund Mortimer was also captured by Glendower in a battle in which 1100 of Mortimer's followers were left dead upon the field. Both Grey and Mortimer married daughters of the Welsh chieftain (now formally proclaimed Prince of Wales), and with him formed the coalition with Harry Percy (Hotspur) against Henry of England. That coalition ended in the battle of Shrewsbury, in July 1403, in which the English king gained a decisive victory, Hotspur being amongst the slain. Next year Glendower made a treaty with Charles VI. of France, who in 1405 sent a force to Wales to act against the English. Meantime, Glendower had been twice severely defeated by Prince Henry (V.) of England. The Welsh prince nevertheless kept up a desultory warfare during the remaining years of his life. He never submitted to English rule, and is believed to have died peacefully in Monmouthshire after 1416. The popular idea of him is presented in Shakespeare's *King Henry IV.* See the works cited at HENRY IV.

Glenelg is a shallow river of Australia, rising in the Victorian Grampians, and entering the Southern Ocean at the boundary between South Australia and Victoria, after a course of 281 miles.

Glenelg. See GRANT, CHARLES.

Glenfinnan, a Highland glen in Inverness-shire, 18 miles W. of Fort William. Here, on 19th August 1745, the clans gathered under Prince Charles Edward's banner, and here in 1815 was erected to his memory a tower bearing an inscription in Gaelic, Latin, and English.

Glengariff, a village of County Cork, at the head of the island-dotted Glengariff Harbour, an inlet of Bantry Bay, and at the foot of a mountain glen, much frequented by tourists.

Glengarnock, an Ayrshire village, with iron works, 3½ miles NNE. of Dalry. Pop. 1628.

Glengarry, a Highland glen in west Inverness-shire, through which the Garry winds 19 miles eastward, from Loch Quoich to Loch Oich, 8 miles SW. of Fort Augustus. It was the home of the Macdonnells from the beginning of the 16th century. The last chief, who died in 1828, is considered to have been the prototype of Fergus MacIvor in *Waverley*.—There is another Glengarry, in the north-west of Perthshire, traversed by the Highland Railway. Its Garry River falls into the Tummel. —For the Glengarry Cap, see BONNET.

Glenlivet, the valley in Banffshire of Livet Water, which runs 14 miles north-westward till, at

a point 5 miles S. of Ballindalloch station, it falls after a total descent of 1600 feet into the Aven, itself an affluent of the Spey. Its population still is largely Catholic. Since 1824 its 200 whisky bothies have given place to one celebrated distillery. In the battle of Glenlivet or Alltacoileachan (4th October 1594) 10,000 Protestants under the Earl of Argyll were routed by the Catholic insurgents under the Earl of Huntly.

Glenmore. See CALEDONIAN CANAL; GREAT BRITAIN, p. 373.

Glenroy, the valley of a stream in Lochaber, Inverness, flowing 15 miles to the Spean at Inverroy, opposite the eastern spur of Ben Nevis. The steep narrow valley through which the Roy runs is remarkable for having its slopes indented with three shelves, which are everywhere perfectly horizontal and parallel to each other, in each case the line on the one side of the glen corresponding exactly in elevation to that on the other. The granitic and metamorphic rocks, of which the mountains are composed, are covered with a greater or less thickness of angular fragments and earth, and an examination of the shelves shows that they are worn out of this soft alluvial coating. They almost invariably form a gentle slope from the hillside, and are from 3 to 30 feet wide. The protrusion of the rocky body of the mountain, and the furrows of mountain-torrents, break their continuity, but with these exceptions one or more of them may be traced along the whole valley. The highest, which is 1139½ feet above the sea-level, is easily followed from the watershed between the Roy and the Spey (which is at the same elevation) along both sides of the valley, as far down as the point at which the valley narrows above Glen Glaster. The second shelf is 80 feet lower, runs parallel with the first all round the head of the valley, and is continued farther down until it includes Glen Glaster. The third line is 212 feet lower than the second; it may be traced along both sides of Glenroy, and round the mouth of the glen into the valley of the Spean, whose sides, at the same elevation of 847 feet, are marked from within 3 miles of the river Lochy up nearly as far as Loch Laggan. Many attempts have been made to explain the origin of these remarkable shelves. Their forming somewhat level roads around the valley originated the popular notion that they were made for the convenience of the heroes whose exploits are sung by Ossian. Playfair, in 1816, supposed they were aqueducts for artificial irrigation. Macculloch believed them to be the shore-lines of fresh-water lakes, which gradually washed away their barriers, remaining for a longer space at the height of the various shelves. This view may now be regarded as accepted, with the additional suggestion of Agassiz that the barrier or dam keeping back the water was formed of glacier ice, the lake having lowered in level as the barrier gradually melted away. See Robert Chambers's *Ancient Sea Margins* (1849); Tyndall, in the *Popular Science Review* (1876); Macfadzean's *Parallel Roads of Glenroy* (1883); and A. Geikie's *Scenery of Scotland* (2d ed. 1887).

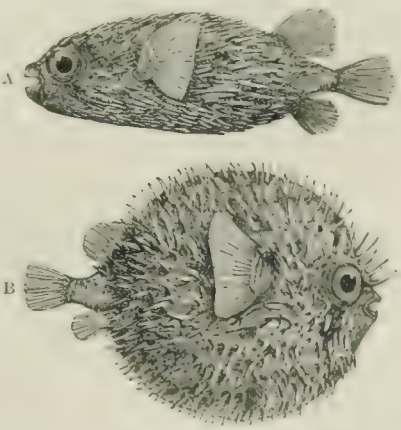
Glen's Falls, a post-village of New York, on the Hudson, 60 miles by rail N. of Albany, with sawmills and machine-shops, and a quarry of black marble. The river, which is crossed by a bridge, here falls about 50 feet, and is very picturesque. Pop., with South Glen's Falls (1890) 11,115.

Glenshiel, a Highland valley of Ross-shire, 58 miles SW. of Inverness. Here, on 11th June 1719, 1500 Jacobites and 274 Spaniards encountered 1600 Hanoverians. The fight was indecisive, but next day the Highlanders dispersed, and the Spaniards had to surrender. Never since then, except for the bloodless French landing in Pembrokeshire (1797), has a foreign force set foot upon British soil.

Glentilt, in north Perthshire, the deep narrow glen of the troutful, impetuous Tilt, which issues from Loch Tilt (3 by 2 furlongs; 1650 feet), and runs 16 miles south-westward, receiving the larger Tarf Water and Fender Burn, until at Blair-Athole it falls into the Garry. It is traversed by the footpath from Blair-Athole to Braemar. Huge Benglo (3671 feet) flanks its left side. Glentilt is classic ground to the geologist, as having furnished evidence for the Huttonian or denudation theory. A famous hunting-ground, too, it has memories of James V., Mary, and Victoria; nor is its right-of-way case (1845) yet forgotten.

Gliddon, GEORGE ROBINS, Egyptologist, was born in Devonshire in 1809, and resided for many years in Egypt, where his father was United States consul at Alexandria, and he himself became vice-consul. He afterwards lectured in America on Egyptian antiquities, and died at Panama in 1857. His works include, besides his *Ancient Egypt* (1850), which was very popular in America, *Types of Mankind* (Phila. 1854), written in conjunction with Dr J. C. Nott, and containing papers by Agassiz and others, and *Indigenous Races of the Earth* (1857), with Dr Nott and others.

Globe-fish, a name given to a number of peculiar Teleostean fishes forming a sub-family (Tetrodontina) of the order Plectognathi. The best-known genera are Tetrodon and Diodon, which may be readily distinguished from one another by the structure of the jaws, which are cleft in the former, undivided in the latter, thus producing the appearance (which the names emphasise) of four and two teeth respectively. Both are represented by numerous species in tropical seas. One species of Tetrodon (*T. lagocephalus*) has been found on British coasts. The globe-fishes are so named from their curious power of filling their bodies with air, and thus distending



A, Globe-fish (*Diodon maculatus*); B, the same inflated.

them till they are nearly globular. The distension takes place chiefly in the œsophagus, and the fish, therefore, when inflated, turns over and floats on its back at the surface of the water. In this position it can not only move forward, but can turn to either side by the aid of its pectoral fins. The globe-fishes have short, thick bodies, sharp, hard beaks, and well-developed fins. The smallest are only a few inches in length, while the Sea-hedgehog (*Diodon hystrix*) measures two feet. The skin is scaleless, but in it are embedded spines which vary

greatly in size and number in the different species. In some they are movable, and are erected with the distension of the body. Darwin, in an account of one species (*D. antennatus*), says that it can secrete from the skin of its belly, when handled, a most beautiful carmine red substance, which stains ivory or paper permanently. He also states that a Diodon has frequently been found floating, alive and distended, inside the stomach of a shark, and that one has even been known to eat its way through the sides of the monster, thus causing its death. Many of the globe fishes are highly poisonous, the poison varying in intensity in different individuals, in different localities, and at different times of the year. The food of these fishes consists of corals, molluscs, and crustaceans, for breaking which their hard beaks are well adapted. Nearly related to the Tetrodontina are the Triodonts (to which the name globe fish might also be extended) and the pelagic Sun fishes (q.v.). All are included in the family Gymnodontes. See Gunther, *Study of Fishes* (Edin. 1880).

Globe-flower (*Trollius*), a small palæarctic genus of Ranunculaceæ, with a globe of large showy sepals enclosing the small inconspicuous linear petals. The common yellow globe-flower (*T. europæus*; *Scottice* Luckengowan) is one of the finest ornaments of moist grounds in elevated districts of northern Europe and in the Alps. It is cultivated in flower-gardens. The orange globe-flower (*T. asiaticus*) is also common in gardens.

Globes. A globe is a round or spherical body (see SPHERE), and in the singular number the word is often used to signify the earth, as in the phrase, 'the terraqueous globe;' but by 'globes,' or 'the globes,' we usually mean a pair of artificial globes used as a part of school-room apparatus. These globes are usually hollow spheres of card-board, coated with a composition of whiting, glue, and oil, upon which paper bearing certain delineations is laid. On one of the pair—the *celestial* globe—are represented the stars, so placed that, to an eye supposed to observe them from the centre of the globe, their relative position and distance correspond to those actually observed; while on the *terrestrial* globe the distribution of land and water, the divisions and subdivisions of the former, together with a few of the most important places, are laid down in the positions corresponding to those which they actually occupy on the surface of the earth.

Globes of india-rubber and gutta-percha have also been made, and others of thin paper, to be inflated and suspended in a school-room. Betts's paper globes fold up when not in use. Embossed globes show, in exaggerated relief, the elevations and depressions of the earth's surface. Compound globes, including the celestial and terrestrial, are made with an outer glass sphere for the celestial, and orrery mechanism to show the varying relative positions of the sun and moon, &c. As school-room apparatus, globes are used for the purpose of illustrating the form and motion of the earth, the position and apparent motion of the fixed stars, and for the mechanical solution of a number of problems in geography and practical astronomy. For this purpose each globe is suspended in a brass ring of somewhat greater diameter, by means of two pins exactly opposite to each other—these pins forming the extremities of the axis round which it revolves, or the north and south poles. This brass circle is then let into a horizontal ring of wood, supported on a stand, as represented in the article ARMILLARY SPHERE; in which the lines drawn on the surface of globes are also explained. The globes in common use in schools are 12 inches in diameter; those found in private libraries are more frequently 18 inches.

The earliest globe made in England was that by Molyneux in 1592, of which an example is still in the library of the Middle Temple.

At the Paris Exhibition of 1889 one of the exhibits was a globe ingeniously designed to show on a realisable scale the proportions of the earth. The globe is on the scale of one millionth of the earth in all respects. The circumference is 40 metres, that of the earth being 40,000 kilometres; the diameter 12·732 metres, corresponding to the 12,732 kilometres of the earth's diameter; and accordingly a metre on the globe represents 1000 kilometres on the earth's surface. The flattening at the poles, which would have amounted to but 21 millimetres, has been disregarded in this globe as being inappreciable. For the same reason the irregularities of the earth's surface are only indicated on the globe by colour, like the other features. The globe, the framework of which is solidly built of iron and wood, is capable of being put in motion. The globe in Leicester Square, London (1851–61), was 60 feet 4 inches in diameter.

Globigerina, an important genus of Foraminifera (q.v.), the shells of which form a great part of the calcareous ooze or mud found in the bed of the ocean, just as they have formed in the past a large percentage (sometimes 90 per cent.) of chalk-deposits. See OOZE.

Globulins are a group of Proteid (q.v.) substances closely allied to Albumen (q.v.; and see ANIMAL CHEMISTRY), but differing from it in that they are not soluble in water unless it contain a small proportion of a neutral salt, such as common salt, and that they are precipitated by carbonic acid, and (except vitellin) by a saturated solution of common salt. The most important globulins which occur in animal tissues are: globulin (proper) or crystallin, in the crystalline lens of the eye; fibrinoplastin or paraglobulin and fibrinogen, in blood, serous fluids, &c.; myosin, in muscle; vitellin, in the yolk of egg. Precisely similar bodies occur also in the vegetable kingdom.

Globulite, the name given by Vogelsang to minute Crystallites (q.v.) having a spherical, drop-like form. See IGNEOUS ROCKS.

Globus Hystericus, or BALL IN THE THROAT, the name applied to a peculiar sensation described under HYSTERIA.

Glockner, or GROSS-GLOCKNER, the highest peak of the Noric Alps, is situated on the boundary between Tyrol, Carinthia, and Salzburg, and is 12,458 feet in height.

Glogau, or GROSS-GLOGAU, a town and fortress in Prussian Silesia, on the left bank of the Oder, 60 miles NNW. of Breslau by rail. It is an important centre of trade, and has wool markets of some note. Manufactures of agricultural implements, pottery, tobacco, sugar, &c. are carried on. There is also a cartographical institute. Pop. (1875) 18,062; (1895) 21,836, including a garrison of above 3000 men. Glogau was a prosperous fortified town in the 11th century. From 1252 till 1476 it was the capital of a duchy, transferred then to Bohemia. The town suffered severely during the Thirty Years' War, and was besieged in 1741, 1806, and 1813–14. See its History by Berndt (2 vols. Glog. 1879–82).

Glommen, or STOR-ELV (i.e. 'great river'), the largest river in Norway, issues from Lake Aursund, at 2339 feet above sea-level, and winds 350 miles southward to the Skager Rack at Frederikstad. Its course is interrupted by frequent waterfalls, the last, with a descent of 74 feet, being the Sarpsfos, 7 miles from the mouth. Its drainage basin measures 15,926 sq. m. It is only navigable a few miles above and below Sarpsfos. Its most

important affluent is the Vormen from Lake Mjösen on the right.

Gloria. See DOXOLOGY.

Gloriosa, a genus of Liliaceæ, of which the best-known species, *G. superba*, a native of India, is a herbaceous perennial with a weak stem, alternate simple leaves, terminating in tendrils, and very beautiful flowers, finely coloured with red and yellow. The root-stock is poisonous, but is washed for its starch, like manioc.

Gloss (Gr. *glōssa*, 'language'), an explanation of such difficulties in a text as are merely verbal, and not relating to the matter itself. The word was originally applied to any obsolete, foreign, provincial, dialect, or technical word, or use of a word, collections of such being called *glossai*. In the Alexandrian period these became common, their subjects the works of Homer and other early poets. Of such glossarians may be named Philetus of Cos, Zenodotus, Aristophanes of Byzantium, Aristarchus, Crates of Mallos, Apion, Ælius Herodianus, Hesychius, Photius, Zonaras, and Suidas. Most of the Rabbinical writers have done the same work for the Hebrew text; so that it would be difficult to name any in particular as Hebrew glossatores. The chief glossatores of the Latin Vulgate are the celebrated Walafridus Strabus, in the 9th century, and Anselm of Laon, who continued Walafried's work (*circa* 1100). In Roman and canon law the practice of introducing glosses was of early origin, and probably was an imitation of the biblical glosses. Among jurists the gloss was not purely verbal, but regarded the true interpretation of the law, and in some cases it was held to be of equal authority with the text itself. From the position which it occupied in the MS., being generally written between the lines of the text and on the margin, it was called *glossa interlinearis*. The gloss of the Roman law is written in very pure Latinity, that of the canon law in the Latinity of the medieval school.

Glossi'tis, inflammation of the Tongue (q.v.).

Glossop, a market-town of Derbyshire, amid bleak but picturesque hills, 13 miles ESE. of Manchester, and 24 WNW. of Sheffield. It is the chief seat of the cotton manufacture in Derbyshire, and has also woollen and paper mills, dyeing, bleaching, and print works, and iron-foundries. Near it is Glossop Hall, the seat of Lord Howard of Glossop. The town was incorporated in 1866. Pop. (1871) 17,046; (1881) 19,574; (1891) 22,414.

Glossopetræ, once much-debated fossils, now known to be sharks' teeth. See SHARK.

Glottis. See LARYNX.

Glottology, a word proposed by Professor Sayce in 1874 as an alternative for Comparative Philology.

Gloucester, the capital of Gloucestershire, a parliamentary and county borough, is pleasantly situated on the left bank of the Severn, which here becomes tidal. It is 114 miles by rail (by road 106) WNW. of London, 38 NNE. of Bristol, and 55 SSW. of Birmingham. The *Caergloui* of the Britons, and *Glevum* of the Romans, whose cruciform ground-plan survives in the four main streets, *Gleauuanceastre* or Gloucester was the seat successively of a nunnery (681), a monastery (821), and a great Benedictine abbey (1022). The last was suppressed in 1539; and its church two years later became the cathedral of the new see of Gloucester—a see conjoined with Bristol in 1836, but disunited in 1897, Bristol becoming again a separate see. Among its thirty-one holders have been the martyr Hooper, the Romanising Goodman (1625–56), Warburton, and Ellicott. Built between 1088 and 1498, and restored since 1853 by Mr Walter and Sir G. G. Scott, the cathedral measures 420 feet by 144 across the transept, and though substantially Norman—crypt, chapter-house, and the interior of the nave *are* Norman—in general character is Perpendicular. Its pinnacled central tower (1457) rises 225 feet, and contains the 'Great Peter' bell, weighing 3 tons 2 cwt. Other noteworthy features are the lofty round piers of the nave, the east window (the largest in England—72 by 38 feet) with its splendid stained glass of 1350, the bog-oak effigy of Robert of Normandy, the exquisite canopied shrine of Edward II., the statue of Jenner, and a group by Flaxman, the lierne vaulting of choir and Lady chapel, the 'whispering gallery' in the triforium, and the matchless fan-vaulted cloisters (1351–1412; see FAN-TRACERY). At Gloucester alternately with Worcester and Hereford are held the festivals of the 'Three Choirs.' A new episcopal palace was built in 1862; the picturesque deanery is the old prior's lodge; and other buildings are the 12th-century West Gate, the New Inn (built about 1450 for pilgrims), the Tolsey or guild-hall, the shire-hall (1816), the infirmary (1755), the county lunatic asylum (1823), the King's or College school, the Crypt grammar-school, the Blue-coat hospital, and a theological college. There is a cross (1863) to Hooper, and a statue (1880) of Raikes, the founder of Sunday schools; in the public park is a chalybeate spring, which was discovered in 1814. Cloth-working, pin-making, and bell-founding all belong to the past; and the commerce of Gloucester is now more important than its manufactures—chemicals, soap, matches, railway plant, shipbuilding, &c. The Gloucester and Berkeley Canal, completed in 1827 at a cost of £500,000, is described in Vol. II. p. 699. The number of vessels entering the port has almost trebled during the last thirty years; the imports include corn and timber, the exports agricultural produce and the minerals of the Forest of Dean. Since 1885 Gloucester has returned only one member. Pop. (1841) 14,152; (1871, as extended) 31,844; (1891) 39,444. Often visited by royalty, from the Conqueror's time to Victoria's, Gloucester was also the meeting-place of eight parliaments. In the Great Rebellion (1643) it held out successfully against Charles I. till Essex relieved it. Among its natives have been (doubtfully) Robert of Gloucester, whose metrical chronicle (1271) was edited in 1888 by Mr Aldis Wright; Taylor, the water-poet; Whitfield, Raikes, and Wheatstone. See works by Rudder (1781), Britton (1829), F. Bond (1848), and Waller (1856); also Murray's *Western Cathedrals* (new ed. 1874).

Gloucester, a port of entry of Massachusetts, on the south side of Cape Ann peninsula, 28 miles NNE. of Boston, with which it is connected by rail, and with an excellent harbour. Its industries are chiefly connected with the cod and mackerel fisheries, which employ several thousand men; but it has also a large trade in the granite quarried here, and manufactures of anchors and railroad iron, besides the building of schooners and fishing-boats, and the import of salt, coal, and lumber from Europe and Canada. Gloucester was incorporated as a town in 1642, and made a city in 1874. Pop. (1880) 19,329; (1890) 24,651.

Gloucester City, a town of New Jersey, on the Delaware, opposite Philadelphia, with which it has half-hourly communication by steamboat. It contains ironworks and several cotton-factories. Pop. (1890) 6564.

Gloucester, DUKES AND EARLS OF. (1) ROBERT, Earl of Gloucester (died 1147), a natural son of Henry I., the principal supporter of his sister Matilda and her son Henry in their contest against Stephen for the English throne.—(2

Gilbert de Clare, Earl of Gloucester (1243–95), one of the most influential nobles during the reigns of Henry III. and Edward I. At first he sided with Simon de Montfort, and helped him to gain the battle of Lewes (1264); but, afterwards quarrelling with Simon, he made common cause with Prince Edward and won for him the battle of Evesham (1265). (3) Thomas of Woodstock, Duke of Gloucester (1355–97), the youngest son of Edward III., was from 1386 to 1389 the virtual ruler of the country. He was put to death by Richard II. at Calais in 1397, on the plea that he was plotting against the king. (4) Humphrey, Duke of Gloucester (1391–1447), fourth son of Henry IV., acted as protector of the realm during the minority of Henry VI. He was arrested for high-treason on 18th February 1447, and five days later found dead in bed. He was a patron of learning, but reckless and foolish in his public conduct.—(5) Richard, Duke of Gloucester, became King Richard III. (q.v.).—(6) Henry, Duke of Gloucester (1639–60), third son of Charles I.—(7) William, Duke of Gloucester (1689–1700), eldest son of Queen Anne. (8) William Henry (1743–1805), George III.'s brother, created Duke of Gloucester and Edinburgh in 1764.—(9) His son, William Frederick (1776–1834).

Gloucestershire, a west midland county of England, lying around the lower course and the estuary of the Severn, and bounded by the counties of Monmouth, Hereford, Worcester, Warwick, Oxford, Berks, Wilts, and Somerset. With a maximum length and breadth of 64 by 43 miles, and an area of 1258 sq. m., it still offers a very irregular outline, though in 1844 some outlying portions were annexed to Wilts, Warwick, and Worcester, and, in like manner, detached pieces of neighbouring counties, but enclosed by Gloucestershire, were incorporated in that county. There are three well-marked divisions, each with its natural characteristics—the Hill, the Vale, and the Forest. The first is formed by the Cotteswold Hills (q.v.), whose highest point is Cleeve Hill (1134 feet); the second, comprising the Vales of Gloucester and Berkeley, by the low rich meadow-lands lying along the Severn; and the third, to the west of the Severn, by the Forest of Dean (q.v.). The principal rivers are the Severn, the Wye, the Upper and Lower Avon, and the Thames, which receives all the waters east of the Cotteswolds. The main rocks, proceeding westward, are Oolitic (Cotteswolds), Liassic, New Red Sandstone, and Carboniferous; the soil is thin on the hills, but produces good pasturage for sheep, while the lower grounds abound in excellent grass and arable land. Permanent pasture and corn crops occupy more than two-thirds of the entire area. Gloucestershire is famous as a dairy country, and raises large numbers of cattle. The well-known double and single Glo'ster cheese is produced in the Vale of Berkeley (see Cheese). The orchards yield great quantities of cider; and woods and plantations cover 82 sq. m. Building-stone is plentiful; and there are two rich coal-fields—that of Bristol in the SW., and the Forest of Dean in the W.: but the ironworks are of less importance than formerly. The woollen manufacture is of ancient standing. Gloucestershire since 1885 contains the parliamentary boroughs of Gloucester and Cheltenham, with part of Bristol, and five parliamentary divisions—Mid or Stroud, North or Tewkesbury, East or Cirencester, Forest of Dean, and South or Thornbury. Its county council consists of 80 members. Pop. (1801) 250,723; (1881) 572,433; (1891) 599,974. Gloucestershire has a wealth of antiquities—prehistoric, Roman, Anglo-Saxon, and medieval. The most noticeable of these, as well as the chief events in its history, its industries, and the names of its worthies, are noticed under the towns, Tewkesbury, Berkeley, Gloucester, Cirencester, Bristol, Fairford, &c. See Worth's *Gloucestershire* (1888), and larger works there cited.

Glover, Richard, an English poet, was born in London in 1712, and was educated at Cheam, in Surrey. He was a prosperous merchant in his native city, and sat in parliament for some years as member for Weymouth. In 1737 he published *Leonidas*, an elaborate poem in blank verse, which was increased from nine to twelve books in 1770, and followed by a posthumous sequel, the *Atheniad* (1788). These poems are not deficient in dignity and elevation of tone, but are turgid and heavy, and are now almost as well forgotten as their author's tragedies, *Boadicea* (1753) and *Medea* (1761). His ballad, *Admiral Hosier's Ghost*, long enjoyed a factitious reputation. Glover was an upright, fearless, and patriotic citizen. He died in 1785; and in 1813 his diary was published.

Gloversville, a post-village of New York, 53 miles NW. of Albany by rail, with large manufacture of buckskin and other gloves. Pop. 13,384.

Glover Tower. See Sulphuric Acid.

Gloves. The glove (Anglo-Saxon *glíf*) which forms the ordinary hand covering is, both from its history and symbolic import, one of the most interesting of all articles of dress. Its use reaches back to a remote antiquity, for we are told in the Odyssey that Laertes, the farmer-king, wore gloves to protect his hands from the thorns. Xenophon also sneers at the Persians for wearing gloves for keeping their hands warm. In their more robust days the Greeks and Romans scorned the use of gloves; but in later times their use was not unknown in Rome. From time immemorial the glove possessed a legal significance in oriental countries in connection with the transfer of property, the handing over of the seller's glove to the purchaser being the recognised token of investiture. In this connection it is held by some that the word translated 'shoe' in Ruth, iv. 7, should more properly read 'glove,' making the passage read: 'Now this was the manner in former time in Israel concerning redeeming and concerning changing, for to confirm all things; a man plucked off his glove and gave it to his neighbour.' In feudal times the challenge to single combat was given by the casting down of the glove; and an ancient and more pleasing ceremonial still observed consists in the presentation of white gloves to a judge presiding over an assize at which no cases come up for trial.

The glove appears to have become a well-known article of dress in England about the 14th century, and corporations of glovers were in existence in the 15th century. In the days of Queen Elizabeth gloves were made with gauntlets upon which much rich and elaborate embroidery was worked.

Modern gloves are of two distinct classes: (1) woven and knitted gloves, and (2) those made of leather; and the making of these constitute entirely separate branches of manufacture. The manufacture of knitted or woven gloves is an industry allied to the hosiery trade, and the materials comprise all the ordinary fibres, the most important being silk and wool. In some cases these gloves are entirely made and finished by knitting; but in others, and in the best of such gloves, the pieces are separately fashioned and sewed together as in making leather gloves. The manufacture is widespread, but the headquarters of the thread and cloth glove trade are now Berlin and Saxony. The materials used for making leather gloves is principally the skins of deer, sheep and lambs, goats and kids, the latter being the most important, although far more 'kid' gloves are made of sheep than of kid leather. The skins for military and

other heavy gloves—doe or buck leather—are prepared by the ordinary process of tanning, or are a fine kind of chamois leather. Those for what are called dressed kid gloves are subjected to a special method of tanning, by which, under the influence of heat, and treatment with a mixture of flour, yellow of egg, and alum, the material is rendered peculiarly soft and flexible. After the leather has been properly prepared it is cut into pieces of the required size, then folded over somewhat unequally, as the back should be larger than the front. Three cuts are then made through the doubled piece to produce the four fingers; an oblong hole is cut at the bending of the fold for the insertion of the thumb-piece; the cutting of this of the exact shape and size requires considerable skill. The first and fourth fingers are completed by gussets or strips sewed only on their inner sides, while the second and third fingers require gussets on each side to complete them. Besides these, small pieces of a diamond shape are sewed in at the base of the fingers towards the palm of the hand. The stitching together of these pieces requires much care, as the junction must be made as closely as possible to the edge of each piece, and yet with sufficient hold to keep the stitches from cutting through the material. A kind of vice or clamp, with minute teeth to regulate the stitches, is used for this purpose in the making of hand-sewn gloves, by which method all the finest gloves are stitched. Sewing-machines are applied for the ornamental or embroidery stitching on the backs of fine gloves, and for almost the entire sewing of the cheaper and heavier gloves. The putting in of the thumb-piece requires special skill and management. Badly made gloves commonly give way at this part. The superiority of the French and the best English gloves depends chiefly upon the adaptation of their shape to the structure of the hand by giving additional size where the flexure of the hand requires it.

Kid gloves are of two principal kinds, Glacé and Suède, according to the manner of dressing and finishing the leather used. Glacé gloves are those which are dressed, dyed, and polished on the hair or outer side of the skin, while Suède gloves are carefully pared, smoothed, and dyed on the inner side of the skin for their purpose, and thus have the appearance of fine chamois.

Paris and Grenoble are the chief seats of the French kid-glove trade. Military gloves are made at Niort and Vendôme. Brussels and Copenhagen are also important glove-making centres. In England, Worcester is the principal seat of the glove industry; and in a speciality, the so-called English dogskin gloves made from tan skins of Cape sheep, English manufacturers are without rivals. See Beck's *Gloves; their Annals and Associations* (1883).

Glow-worm, a name applied to numerous 'phosphorescent' beetles in the sub-family Lampyrides (fam. Telephoridæ) already distinguished from the Fire-flies (q.v.). They are nocturnal in habit, and represented by about 500 species, widely distributed, especially in warm countries. The phosphorescent structures are situated on the abdomen, and are present in the larva as well as in the adult forms. The larvæ are elongated, but flattened, of a velvety black colour, and feed especially on living snails. The adult females tend to retain a larval appearance, and are often destitute of wings.

The commonest European glow-worms are *Lampyris noctiluca* and *L. splendidula*—the *Johannis-würmchen* of the Germans—in both of which the females are slightly larger and wingless. The male of the former is also comparatively sluggish and keeps among the grass, while that of the latter flies actively about in the evenings. The general life-history of such Lampyrides is as follows: The yellowish phosphorescent eggs are laid in early spring; the voracious larvæ are vigorously crawling about by April; in summer, however, they fall into a pupa slumber, and may so remain till the next spring, when adult life is attained. In *Lampyris noctiluca* (which is the British species) the females

Glow-worm (*Lampyris noctiluca*):
a, male; *b*, female.

give the more brilliant light, but in other cases the reverse is often true, while in one of the American species (*Photinus dimissus*) only the male is luminous.

Gosse has described a number of West Indian forms, such as *Photuris versicolor* and the yet more gorgeous *Pygolampis xanthophotis*, which with green and orange lights respectively sometimes light up the foliage with bewitching brilliancy. America is very rich in 'lightning-bugs,' such as *Photuris pennsylvanicus*, and species of Pyractomena and Photinus. Pyrocœlia, Luciola, and Lamprocera are other important genera widely distributed.

The luminous organs consist, like those of the Fire-flies (q.v.), of fatty-looking cells round which there is a plentiful supply of tracheæ, affording the necessary oxygen for the rapid vital combustion of phosphorescence. In regard to their utility it has at least been settled by the experiments of Emery and others that they serve as love-signals between the sexes, while it is probable that the flashes also illumine the beetles' paths and frighten designing foes. For what is known of the real physiology of luminosity, see PHOSPHORESCENCE. Professor Emery gives a most entertaining account of his observations on the love-lights of *Luciola italica*, which he studied in the meadows round Bologna. By catching females and imprisoning them in glass tubes in the meadows he satisfied himself that sight, not smell, was all important. When the females caught sight of the flashes of an approaching male, in spite of their tantalising situation, they allowed their splendour to shine forth. In the two sexes the colour of the light is identical; the intensity also appears much the same, though that of the female is more restricted. The most noteworthy difference is that the luminous rhythm of the male is more rapid and the flashes briefer, while that of the female is more prolonged, at longer intervals, and more tremulous. The attracted males dance round about the female, who after having captivated one suitor, proceeds to signal other rivals, till she is finally surrounded by a circle of devotees. See articles by Professor C. Emery, *Bull. Soc. Entomol. Ital.*, 1885 87; and C. F. Holder's *Living Lights* (1887).

Gloxinia, a genus of plants of the order Gesneraceæ, with a nearly bell-shaped delicately-tinted corolla and richly-coloured leaves. Natives of tropical America, they have since 1820 become ornaments of European greenhouses. The species is named after a botanist, Gloxin of Colmar, who wrote in 1785.

Gluchov, a town in the Russian government of Tchernigoff, 112 miles E. of the town of that name, has manufactures of soap, candles, and leather,

and a considerable trade in grain. In the vicinity is the chief source for porcelain clay in the empire. Pop. 17,369.

Glucinum, or BERYLLIUM (sym. Gl., eq. 9·4), is a metal with a specific gravity of 2·1. It is white, malleable, and fusible below the melting point of silver. It does not burn in air, oxygen, or sulphur, but in the first two substances it becomes covered with a thin coat of oxide. It combines readily with chlorine, iodine, and silicon. Even when heated to redness, it does not decompose water. It dissolves readily in hydrochloric and sulphuric acids, and in a solution of potash, but is insoluble in ammonia, and only slightly acted on by nitric acid. Glucinum was first obtained from glucina by Wöhler in 1827, who procured it by decomposing the chloride of glucinum, obtained by evaporating a solution of glucina in hydrochloric acid. Debray afterwards (1854) obtained it much more abundantly by a method similar to that employed by Sainte-Claire Deville for the reduction of aluminium. The name glucinum or glycinum (from the Gr. *glukus* or *glykys*, 'sweet') was given to the metal on account of the taste of its salts.

Glucina, GlO, the one oxide formed by glucinum, is an earth obtained by Vauquelin in 1797 from the emerald, and which was afterwards found in the beryl and a few minerals. Glucina is a white, loosely coherent powder, without taste or smell. When heated to the strongest temperature of a wind furnace it assumes the form of microscopical prisms resembling corundum. Glucina is perfectly insoluble in water, and only dissolves in dilute acids when it has not been ignited strongly. It is easily soluble in boiling concentrated sulphuric acid, and if fused with an alkali, and the cold mass treated with water, the glucina goes into solution. Glucinum hydroxide, $Gl(OH)_2$, is thrown down as a gelatinous precipitate when a glucinum salt is precipitated with ammonia. Glucinum forms salts with the various acids; they are colourless, and much resemble those of aluminium. The mineral *phenakite* is a pure silicate of glucina. The *beryl*, of which the *emerald* is a variety, is a double silicate of glucina and alumina. The mineral *euclase* is also a double silicate of the same earths; while the *chrysoberyl* is an aluminate of glucina, coloured with ferric oxide.

Gluck, CHRISTOPH WILLIBALD, RITTER VON, the reformer of opera, and the first great name among modern opera writers, was born 2d July 1714, at Weidenwang, a small village of Bavaria, 24 miles N. of Ingolstadt. His mother, like those of Haydn, Beethoven, and Schubert, seems to have been a cook; his father had been one of those German free-lances who sold their military service to the highest bidder during the troublous times of the Marlborough campaigns, and now, tired of fighting, had taken service under various princelets in the capacity of forester. Gluck had given no indication that music was to be anything more to him than a favourite recreation, until at Prague University he found himself forced to supplement a very scanty allowance by teaching music; and at the age of twenty-two the call of art had become so imperative that he decided to try his fortune among the musicians of Vienna. There the good offices of his patron Prince Lobkowitz, and the friendship he contracted with Count Melzi, another noble amateur, were of great service to him. He was introduced to the best society and placed for four years under the famous Sammartini (or San-Martini), the predecessor of Haydn, and a composer of great energy and originality. In 1741 he received a commission for his first opera, *Artaserce* (in one act), and six others followed in the succeeding four years. The growing fame of the young composer travelled as far as England, and in 1745 Lord Middlesex, the enthusiastic operatic *entrepreneur*, invited him to London, when a new opera, *La Caduta de' Giganti*, was performed. Handel, an autocrat at that time in London, pronounced the stranger's music 'detestable,' and declared 'he knows no more about counterpoint than my cook.' Gluck's London visit must be called the turning-point in his career. His study of Handel's work revealed to him some unsuspected capabilities of music in illustrating the text; and the complete failure of *Piramo ed Tisbe*, a miserable *pasticcio*, or collection of shreds and patches from various sources, and dignified by the name of opera, turned his thoughts to the consideration of truths which, however unsuited or antagonistic to the demands of popular taste and usual practice, lie deep down at the foundation of all dramatic art. A visit to Paris gave him an opportunity of hearing the excellent 'recitative' writing of Rameau, and thus inspired him anew for his great mission; and when in 1746 he left London for Vienna by Hamburg and Dresden, noting doubtless in these great opera schools more to avoid and more to strive after, we may say that his first period of work was completed.

The next opera he contributed to the Vienna stage shows signs of the direction in which his ideal was tending, and some of the music in *Telemaco* (produced in Rome, 1750) and *La Clemenza de Tito* (Naples, 1751) he afterwards considered good enough to be incorporated in *Armide* and *Iphigénie;* but the transition period—during which in 1755 or 1756 the pope made him a 'knight of the Golden Spur'—has not much of interest to offer. The light and frivolous Metastasio held as it were a monopoly in Vienna as librettist, and his plots were more suited to the kindred genius of Hasse than to that of the serious reformer. Gluck turned to Calzabigi, imperial councillor and well-known literary amateur, and in 1762, after much ruthless digging among the rubbish of Italian opera to provide a firm foundation, he succeeded triumphantly in laying the corner-stone of the modern music drama in *Orfeo*, with the notable title, 'Dramma per Musica.' Constant collaboration with the librettist was of great assistance to both in the production of a coherent organic whole. This work was followed in 1766 by *Alceste*, with a simple pathetic plot, and even more severely classical than its predecessor in libretto and treatment. The letter of dedication to the Duke of Tuscany, which was printed as a preface, at once explains his theories and proclaims the careful and logical thought which led him to adopt them.

The standard of ideal opera was still further advanced in *Paride ed Elenna* (1769), the last work written for Vienna before he entered on his brilliant career in Paris. The popularity of the dauphiness, who as Marie Antoinette had been his pupil in Vienna, was of great assistance to Gluck in his attempt to establish himself on the then premier opera stage of Europe. His first work there, *Iphigénie en Aulide*, on Racine's play, proved an enormous success, and *Orphée*, an adaptation of his earlier *Orfeo*, stirred the utmost enthusiasm among the rapidly increasing number of his supporters. The French version of *Alceste*, though received coldly at first, became quite as popular. Gluck was at the summit of his success when the storm broke—the famous Gluck and Piccini war began. An eye to business more probably than the usual charge of jealousy seems to have been the motive for inviting the well-known Italian composer Piccini to Paris and pitting him directly against Gluck. Musical Paris was immediately and sharply divided into Gluckists and Piccinists. The comparative failure

of Gluck's *Echo et Narcisse* (September 1779), and the superior ability of the literary men in the ranks of the Piccinists, long made it impossible to say towards which side victory inclined, until the continued success of the earlier *Iphigénie en Tauride* (produced in May 1779) finally decided it in Gluck's favour. Piccini's opera of the same name, a much inferior work, proved a very effective weapon in the hands of the Gluckists. The conqueror retired from Paris full of honour and comparatively wealthy. Two strokes of paralysis warned him against undertaking any more active work; and a third severer shock in 1786 was the forerunner of death, which in the following year (November 15, 1787) ended an exceptionally long, vigorous, and successful career.

As Gluck's energies were, with one or two unimportant exceptions (*Odes and Songs* by Klopstock, a 'De profundis,' and a 'Dominus noster'), directed exclusively to the composition of operas, excerpts from which, even when complete enough in themselves for effective quotation, must necessarily labour under the disadvantage of being separated from the context, the excellence of his work is little known in England and America, and its importance is almost invariably overlooked or underestimated. His gift of melody was not so full, rich, and spontaneous as that of other composers of the first rank, but the care he exercised to leave no means unemployed by which he could illustrate every turn of expression in the words makes no small amends.

Ample testimony is borne to his genius for orchestration by numerous passages in Berlioz's standard *Treatise on Instrumentation*, where, among sixty-four examples of remarkable effects, no less than seventeen are from the works of Gluck. These and other excellences made his work capable of performing a mission the importance of which cannot be too highly stated or too often insisted on. He found the opera an emasculated creation, paying attention only to roundness and sensuous beauty of form, neglecting ethic, dramatic, and poetic principles as much as natural manliness. He left it with a lofty ideal of a time when the libretto should be as serious and noble in purpose as the music; when the musician's first and only effort should be to clothe and illustrate the words; when even the necessity of action might be subordinated to the development of character, and feelings be painted rather than deeds. He also inspired the succession of great men who followed him on the stage of Paris, and who worked along his line until Wagner, a deep student of Mozart, Beethoven, and Weber, applied his genius to the improvement of Gluck's ideal, and called it the Music Drama. See his Life in French by Desnoiresterres (1872); in German, by Schmid (1854), Marx (1863), and Reissmann (1882); E. Newman, *Gluck and the Opera* (1896); and the article OPERA.

Glückstadt, a town in the Prussian province of Sleswick-Holstein, on the right bank of the Elbe, 32 miles by rail NW. of Hamburg. Founded in 1616 by Christian IV. of Denmark, it is a pretty town, regularly built, and intersected by canals, its chief building the Rathhaus (1642; restored 1874). Its harbour remains open in winter, when the Elbe higher up is frozen, and has been much improved since 1880. During the Thirty Years' War Glückstadt successfully withstood three sieges; its fortifications were demolished in 1815. Pop. 5983.

Glucose, or GRAPE SUGAR. See SUGAR.

Glucosuria, a modern name for Diabetes Mellitus (see DIABETES), and indicative of its characteristic symptom, the presence of sugar in the urine.

Glue is merely an impure *Gelatine* (q.v.). Almost every animal substance will yield it, hence all kinds of animal refuse find their way to the glue-makers' boilers. The refuse of tanneries, consisting of the clippings of hides, hoofs, ear and tail pieces of ox, calf, and sheep are preferred, because they can be dressed with lime, which removes the hair, and acts as an antiseptic. For this purpose they are placed in tanks with quicklime and water for two or three weeks. They are afterwards washed and dried, and are ready for use by the glue-maker, who usually gives them another heavier lime-dressing, and subsequently washes them; they are afterwards exposed to the action of the air for a time, to neutralise the caustic lime. When well drained, the pieces are placed in flat-bottomed copper-boilers, which have a perforated false bottom placed a little distance above the true one, to prevent the burning of the materials, and which have been supplied with rain or other soft water up to two-thirds the depth of the boiler, the pieces being piled up to some height above the top of the open boiler. The whole is kept at a gentle boiling heat until all the gelatinous part has dissolved out, and the mass of material has sunk down into the fluid. The boiling is sustained until, by repeated trials of small quantities, the operator knows the fluid is of the right consistency, when it is drawn off carefully into the congealing boxes.

The congealing boxes are of wood, and are nearly square, being slightly narrower at the bottom than the top; they are filled to the brim, and when their contents are sufficiently solidified the glue, with a little management, turns out in the form of a cube, which is cut into thin slices by a wire in the same manner as soap; and these larger slices are subdivided into smaller cakes by a wet knife. Frames, with nets stretched upon them, are provided for drying the cakes upon; and these frames, when covered with the cakes of glue, are adjusted one over another at a little distance apart, supported between four uprights, and, if in the open air, covered over with little wooden roofs, the whole being arranged so that the air can have free access to facilitate drying. This process is an anxious one for the manufacturer, as the changes of the weather have great and often completely destructive effects upon glue in this state. In Britain spring and autumn are the best drying seasons. Generally, after the open-air drying, the glue is taken to drying-rooms, heated slightly, where it hardens effectually; but it is not yet finished; the cakes at this stage have a dull, unsightly look, to remedy which they are dipped into cold water, or are wetted with a brush dipped in hot water, and redried, this wetting giving the cakes a bright varnished appearance.

While England does not excel in this manufacture, it is a recognised fact that Scottish glue—such as that made by Messrs Cox at Edinburgh—ranks in the front of the glues of all countries. A light-coloured glue is not necessarily good, nor dark-coloured glue necessarily bad. A bright clear claret colour is the natural colour of hide-glue, which is the best and most economical. Light-coloured glues (as distinguished from gelatine) are made either from bones or sheepskins. The glue yielded by these materials cannot compare with the strength of that yielded by hides. A great quantity is now made in France and Germany from bones. It is got as a by-product in the manufacture of animal charcoal. Although beautiful to look at, it is found when used to be far inferior to Scottish hide-glue. The latter is largely used by match-makers, piano-makers, and cabinet-makers, who export their goods to all parts of the world, and to whom, owing to the damp climates of many parts

to which they export, a first class glue is absolutely necessary. Besides its use in joinery, cabinet making, book binding, match making, and similar operations, glue is used by paper makers and in dressing silks; and for these last two purposes fine light coloured kinds in thin cakes are made. Large quantities are employed by paper-hangers and others for sizing walls. It is also used for stiffening straw, cotton, horsehair, and other plaits for making bonnets and hats. See Dawidowsky, *Glue, Gelatine, &c.*, Eng. trans. 1884.

Marine Glue is not a glue, but a cementing composition used in shipbuilding, for paying seams in ships' decks after being caulked. In hot climates it is preferred to tar for this and other purposes, where the materials are exposed to the influence of wet. It consists of india-rubber cut very small, and digested at a gentle heat in a closed vessel with coal tar naphtha until it is dissolved, when powdered shell-lac is added, and the digestion continued until it also is dissolved.

Glukhov. See GLUCHOV.

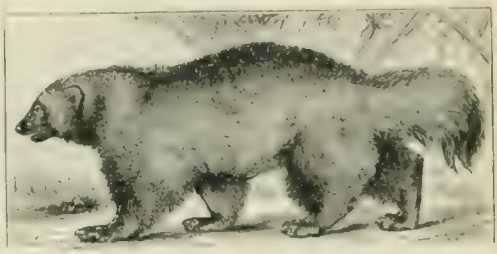
Glume, a term applied to certain bracts in grasses and sedges (which are sometimes conjoined as Glumiferæ). See GRASSES, CYPERACEÆ.

Gluten is one of the most important constituents of the varieties of corn used as food. It is obtained by mixing flour with water, and thus forming a paste or dough. This paste is placed in a bag of fine linen, and kneaded in water, which must be repeatedly changed till it ceases to assume a milky appearance. A gray, tenacious, viscous, tasteless substance, having the appearance of birdlime, is left in the bag. This substance consists mainly of gluten, mixed with traces of bran starch and of oily matter. The gluten thus obtained from wheat and from rye is far more tenacious than that which is obtained from the other cereals, and it is the great tenacity of this constituent that especially fits these flours for conversion into bread. It is found by analysis that the proportion of gluten (16 per cent.) contained in wheat grown in Algeria and other hot countries is considerably higher than in wheat grown in England (10·7 per cent.), or still colder countries; the proportion in the wheat of the United States seems to vary from 9·85 to as much as 15·25 per cent.; and the hard, thin-skinned wheats contain more of this ingredient than the softer varieties of the grain.

Gluten in a moist state rapidly putrefies, the mass acquiring the smell of decaying cheese; but when dry it forms a hard, brownish, horny-looking mass, that does not very readily decompose. On treating gluten with hot alcohol, we find that it resolves itself into at least two distinct substances, one of which is soluble, and the other insoluble in that fluid. The insoluble portion—vegetable fibrin—is a gray, tough, elastic substance, insoluble in water or in ether, but readily soluble in dilute alkalies, from which it is precipitated by neutralisation with acetic acid. The soluble portion is in part precipitated from the alcohol on cooling, in the form of flakes, which have the composition and properties of casein—a vegetable casein; while a third substance, *gliadin*, remains in solution, giving to the alcohol a syrupy consistence, but separating on the addition of water, as a white substance resembling albumen. All these constituents of gluten contain carbon, hydrogen, nitrogen, oxygen, and sulphur, in much the same proportion as the animal albuminates or protein bodies, and they all doubtless belong to the flesh-forming group of foods.

The action of gluten in the manufacture of bread is probably a double one; it induces, by constant action, an alteration of the starch, and subsequent fermentation, while by its tenacity it prevents the escape of carbonic acid gas. See BREAD.

Glutton (*Gulo*), a carnivorous quadruped belonging to the weasel family (Mustelidæ). There are three false molars in the upper, and four in the lower jaw, anterior to the carnassial tooth, which is large and sharp. The body is long—about 2 feet 6 inches—the legs are short, the feet have each five deeply-divided toes, terminated by long curved claws. The tail is rather short—about 7 or 8 inches; a fold beneath the tail supplies the place of the glandular pouch of the badgers; but when hard pressed by enemies the gluttons emit a peculiar fluid of a strong musky odour. Their habits are nocturnal. Both body and tail are covered with long hair, under which the body is covered with a rich thick fur. The general colour of the long hair is brown, sometimes approaching to black, lighter bands passing from the neck along the flanks, and meeting at the tail. The short fur is chestnut brown. The muzzle is black. A light-brown band runs across the forehead from ear to ear. The fur of the glutton is sometimes of considerable value, and is used for muffs, cloaks, &c.,



The Glutton (*Gulo luscus*).

but varies not a little in glossiness and other qualities (see FURS, *Wolverine*). There is only one species, commonly called Glutton, and also Wolverine (*G. luscus*), a native of the northern parts of Europe, Asia, and America. It is more common in the arctic regions than towards the southern limits of its distribution, which are about the forests of Courland, in Europe, and northern California, in America. The most extraordinary stories were at one time credited concerning the ferocity, voracity, and cunning of this animal, though in captivity it has been known to overcome and kill a large polar bear (1897); it is very capable of domestication, and even in a wild state exhibits no remarkable ferocity; nor is there any reason to believe that it leaps from trees on deer, or pursues any of those artful methods of procuring food which were once ascribed to it. It often preys on animals which it has not itself killed. The smaller quadrupeds are its principal food, and it devours young foxes in great numbers. Its speed is not great, but it excels in strength and perseverance. The traps set for the smaller kinds of animals—e.g. martens—in the fur countries of North America are very often robbed by the wolverine, and it has been known to remove a great pile of wood in order to get at provisions which had been hidden under it.—Closely allied to the glutton are the grison, the badger, the otter, and the ratel. Bone-caves and some of the newest deposits exhibit remains of more than one species of glutton.

Glycerine, GLYCEROL, or PROPENYL ALCOHOL, $C_3H_5(OH)_3$, was discovered by Scheele in 1779, who obtained it in the preparation of lead-plaster, and named it 'the sweet principle of fats.' It is a colourless, viscid, neutral, inodorous fluid, of an intensely sweet taste, is soluble in water and alcohol in all proportions, but is insoluble in ether

and in chloroform. Its specific gravity is 1·27. If quickly cooled down, glycerine does not crystallise, but solidifies at 40° C. into a gum-like mass. In the winter of 1867 it was discovered that some glycerine which was being shipped to England had frozen into a solid crystalline mass; till then glycerine was believed to be uncrystallisable. At 100° it is slightly volatile, but if distilled alone the greater part of it becomes decomposed; it may, however, be distilled without alteration in a current of superheated steam. By this means Wilson succeeded in 1854 in separating heated fats into glycerine and the acid with which it was previously in combination; the glycerine is thus obtained in a high state of concentration as a colourless, syrupy liquid, which can be thus prepared in unlimited quantity.

Glycerine occurs ready formed in a few fats (as, e.g., old palm-oil), and, according to Pasteur, is contained in all fermented liquors, and especially in wine. It is a product of the saponification of the various fats. See SOAP.

Glycerine is a triatomic alcohol—i.e. it is derived from three molecules of water by replacing three atoms of hydrogen by the triatomic radical C_3H_5; or it may be considered a compound of C_3H_5 with three molecules of hydroxyl, OH—and may be represented by the formula $C_3H_5(OH)_3$; and in the animal and many vegetable fats, the three molecules of hydroxyl are replaced by three molecules of the anhydrous fatty acid. In the saponification of these fats—that is to say, when they are treated with potash, soda, or oxide of lead, or under the influence of superheated steam—the fatty acid separates from C_3H_5, which assimilates three molecules of hydroxyl and becomes glycerine. Glycerine forms soluble compounds with baryta, strontia, and lime; and it dissolves oxide of lead and numerous salts. It is found that glycerine is convertible into a true fermentable sugar when treated with a mixture of potassium bichromate and sulphuric acid, or with potassium permanganate in presence of sunlight.

We have already referred to the best mode (Wilson's process) of obtaining glycerine on a large scale; the usual method of obtaining it on a small scale is from olive-oil, which is saponified by treating it with an equal weight of litharge (lead oxide). This is mixed with water, and added to the oil, with which it is boiled till the saponification is complete. The glycerine is dissolved by the water, and is easily separated from the insoluble lead-plaster (a mixture of oleate and palmitate of lead). Any traces of lead are removed by sulphuretted hydrogen, and the water is expelled *in vacuo*, as the glycerine would turn brown in the open air.

The uses of glycerine are numerous. In medicine it is employed as a local application in diseases of the skin and of the ear; it is used as a solvent for many drugs; and is taken internally for the same purposes as cod-liver oil. It is a valuable preservative fluid for small and delicate anatomical preparations, and it has been applied to the preservation of meat. It is used in perfumery, in calico-printing, and in the preparation of leather. It is used by the wine-dealer to 'improve' the quality of wine, and by the brewer, as it is said, to impart keeping power to beer. Very large quantities of glycerine are required for the production of Nitro-glycerine (q.v.) and other explosives. It has been added to the water in gas-meters with the view of preventing it from freezing. It is used in the manufacture of copying-ink, and is of general application where a lubricating agent is required.

Like the alcohols in general, to which class glycerine belongs, it forms several classes or series of derivatives, the most important of which are its combinations with acids, which are analogous in their composition to the various fats and oils. See Roscoe and Schorlemmer's *Treatise on Chemistry*, and Schorlemmer's *Manual of the Chemistry of the Carbon Compounds*.

Glycocoll, or AMIDO-ACETIC ACID, $CH_2NH_2CO_2H$, was first prepared by Braconnot in 1820, being obtained among the products of the action of sulphuric acid on glue, and received from him the name *sucre de gélatine*, on account of its sweet taste. It is a product of various processes of decomposition of animal matters. Glycocoll is very soluble in water, the solution having no effect on vegetable colours, but it is insoluble in alcohol. Glycocoll combines both with acids and bases, and the compounds in both cases are soluble and crystallisable.

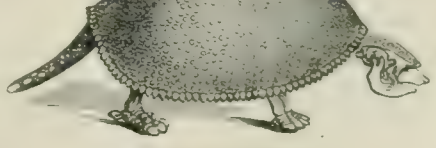
Glycogen, $C_{12}H_{20}O_{10}.H_2O$, sometimes called animal starch, was discovered by Claude Bernard in the human liver as well as that of graminivorous animals. It has been shown to exist very widely diffused throughout the animal kingdom, and appears to be an essential accompaniment of cellular growth, occurring in large quantities in the fœtus. It occurs also in blood and muscular tissue. It is found in mollusca, dried oysters being said to contain as much as 9·5 per cent. Glycogen has also been detected in the vegetable kingdom, in moulds and other fungi. Its uses in the animal economy are noticed in the article LIVER.

Glycol is the type of a class of artificial compounds, whose existence was inferred, and afterwards discovered, by Wurtz. In their chemical relation and properties they form an intermediate series between the monatomic alcohols, of which common alcohol is the type, on the one hand, and the triatomic alcohols, a class of bodies of which ordinary glycerine is the type, on the other. The name of glycol, formed from the first syllable of glycerine and the last of alcohol, has been given to express this relation. The glycols are accordingly termed diatomic alcohols. Ordinary glycol is formed from ethylen, C_2H_4, and hence may be called ethyl-glycol, to distinguish it from propyl-glycol, which is formed from propylen, C_3H_6, from butyl-glycol, which is formed from butylen, C_4H_8, or from amyl glycol, which is formed from amylen, C_5H_{10}. Glycol is a colourless, slightly viscid fluid, with a sweet taste, and its composition is expressed by the formula $C_2H_4(OH)_2$. See Schorlemmer's *Manual of the Chemistry of the Carbon Compounds*.

Glycose. See SUGAR.

Glycosmis, a genus of Aurantiaceæ, trees of the East Indies. The fruit of *G. citrifolia* is delicious.

Glyptodon (Gr., 'engraved tooth'), a gigantic fossil animal belonging, like the Megatherium (q.v.) and the Mylodon (q.v.), to the Edentata, but of the family of the Dasypodidæ or Armadillos.



Glyptodon clavipes.

It is found in the post-tertiary deposits of the pampas of South America, and four species have been described. The back and sides of the creature were covered with a carapace of thick, nearly hexa-

gonal, bony scutes, which in some cases was nearly 6 feet long. The head was similarly protected by a helmet of bony plates, while its tail was completely sheathed in a casing of the same kind. The glyptodon must, from the shape of the carapace, have looked liker a huge tortoise than an armadillo. Unlike the latter, it had no movable bands in its armour, and therefore could not roll itself up when attacked by its enemies. Its teeth, eight in each jaw, had each two lateral sculptured grooves, whence the name.

Gmelin, LEOPOLD, a German chemist, was born at Göttingen, 2d August 1788, and died at Heidelberg, 13th April 1853. Having studied medicine and chemistry at Göttingen, Tübingen, and Vienna, he began to teach chemistry at Heidelberg in 1813. Four years later he was made professor of Medicine and Chemistry, and held that chair until 1850. His great work is an excellent dictionary of chemistry, entitled *Handbuch der Chemie* (1817–19). Besides this he wrote, along with Tiedemann, a book on digestion (1826–27), and another on the method by which the food-products pass into the blood (1820). The *Handbuch* was translated into English and enlarged by Watts (1848–59).—His grand-uncle, JOHANN GEORG GMELIN, born at Tübingen, 10th August 1709, professor of Chemistry and Natural History at St Petersburg from 1731, and Botany and Chemistry at Tübingen from 1749, died there 20th May 1755. He spent ten years (1733–43) of his life travelling in Siberia, making observations on the botany, and wrote *Flora Sibirica* (1748–49) and *Reisen durch Sibirien* (4 vols. 1751–52). His nephew, SAMUEL GOTTLIEB (1744–74), became professor of Botany at St Petersburg (1767), studied the botany of the southern portions of Russia, and wrote *Historia Fucorum* (1768). Another nephew, JOHANN FRIEDRICH (1748–1804), father of Leopold, wrote a botanical dictionary, *Onomatologia Botanica Completa* (9 vols. 1771–77).

Gmelina, a genus of verbenaceous trees. The timber of *G. arborea* (Koombar or Goombar of India) resembles teak, but is closer in grain, and lighter.

Gmünd, a town of Würtemberg, stands in the charming and fertile valley of the Rems, 30 miles E. of Stuttgart by rail. It has some fine old churches, and carries on important manufactures of jewels and hardware; hops and fruit are much grown in the neighbourhood. Gmünd in the middle ages was an imperial free city of Swabia, with 18,000 inhabitants. It was added to Würtemberg in 1803. Pop. (1875) 12,838; (1885) 15,321. See works by Grimm (1869) and Kaisser (1882).

Gmunden, a town of Upper Austria, 159 miles W. of Vienna by rail. It lies 1439 feet above sea-level, amid the grandest scenery of the Salzkammergut, at the lower end of the Traunsee or Lake Gmunden (8 by 2 miles), above which towers the Traunstein (5536 feet). With numerous hotels and villas, it is a favourite summer bathing place. Salt-mines employ many of the inhabitants. Pop. 6631. See Feurstein, *Der Kurort Gmunden* (6th ed. Vienna, 1885).

Gnaphalium. See CUDWEED, EDELWEISS.

Gnat (*Culex*), a genus of dipterous insects represented by numerous widely distributed species, and specially abundant in marshy districts. There are nine British species, of which the Common Gnat (*Culex pipiens*) may be taken as typical. The colour of the middle portion of the body on the upper surface is yellowish-brown, marked with darker longitudinal lines; the posterior part is light gray. The abdomen is long, slender, and slightly flattened; the legs, very long and thin; and the delicate glassy wings bear numerous hairs on the veins and along their posterior margins. When the insect is at rest the wings are laid flat back upon the body. The antennæ consist of fourteen joints, and bear circlets of hair, which, in the male, may be so long and thick as to give a feathery appearance. The female is furnished with mandibles which are absent in the male. The male gnat sips nectar from the flowers and passes his days in joyous dancing in the sunlight; the female spends, not her days only, but her nights, in pursuit of men and cattle into whom she may drive her sharp lancets, to suck from their blood her more nutritious, if less delicate diet. The proboscis, whose double function of piercing and sucking was noticed even by Pliny, is an extremely complex structure composed of representatives of the three usual mouth appendages. The humming sound produced by the female in flying, the deeper notes of which are due to the rapid vibration of the wings (computed at 3000 per minute), the higher to membranes on the thoracic openings of the air-tubes, serves in part, doubtless, to attract the males. Darwin quotes Mayer to the following effect: 'The hairs on the antennæ of the male gnat vibrate in unison with the notes of a tuning fork, within the range of the sounds emitted by the female. The longer hairs vibrate sympathetically with the graver notes, and the shorter hairs with the higher ones.' Landois also says that he has repeatedly brought down a whole swarm of gnats by uttering a particular note. After fertilisation, the female lays her eggs—300 at a time, it may be—in a pool or ditch of stagnant water, mooring them by a glutinous substance to a floating leaf or twig. The larvæ, which in favourable circumstances are hatched in a few days, are about half an inch long, of a black colour, intensely active, with bristle-fringed mandibles which vibrate continually, making a little eddy which conveys food-particles to their mouths. When at rest, they suspend themselves head downwards from the surface of the water, and take in air through a curious tube projecting from the eighth segment of the abdomen. They remain in the larval state about three weeks, during which period they moult three times. The pupa is smaller and lighter in colour; it also is active, though, of course, it takes no nourishment. Its external air-tubes are situated on the sides of the thorax, and project beyond its head. When mature, the pupa comes to the surface, the skin splits longitudinally, and the perfect gnat slowly emerges. Many, however, never taste the delight of flying, for their weak wings being drenched cannot be spread, and the insects are drowned without fully escaping from their pupa-skin. Several generations of gnats follow one another in a season. In the Fen district they are sometimes so abundant that the inhabitants are forced to use curtains

Life-history of the Gnat (*Culex pipiens*): *a*, larva; *b*, pupa; *c*, perfect insect emerging; *d*, male; and *e*, female gnat.

and such means of protection against them as are used in hotter countries against their allies the Mosquitoes (q.v.). Gnats occasionally swarm together in such numbers that they present the appearance of dense clouds of smoke; and it is recorded that, in the year 1736, an alarm of fire was raised in Salisbury because of the vast columns of gnats swarming round the cathedral spire.

Gneisenau, August Wilhelm Anton, Graf Neithardt von, one of the Prussian generals of the war of liberation, was born at Schildau, in Prussian Saxony, 27th October 1760. In 1782 he accompanied the German auxiliaries of England to America. On his return he joined (1786) the Prussian army, and twenty years later fought at Saalfeld and in the battle of Jena. He gave convincing proof of his military genius in the defence of Colberg from April to July 1807; and this led to his appointment on the commission for the reorganisation of the Prussian army, in which capacity he lent cordial support to the plans of Stein and Scharnhorst. In the war of liberation he rendered distinguished service at the battle of Leipzig (1813). But his most meritorious work was his share in the Waterloo campaign, in which he was chief of Blücher's staff, and principally directed the strategy of the Prussian army. He had been fifteen years on the retired list when, in 1831, on the outbreak of the Polish rebellion, he was made field-marshal and given command of the Prussian army on the Polish frontier, but he died at Posen on 24th August that same year. See his Life by Pertz (5 vols. 1864–80) and Delbrück (2 vols. 1882).

Gneiss, a term introduced from the German for a foliated crystalline-granular compound of quartz, felspar, and mica. The quartz is white or gray, and occurs in lenticular layers that vary from a mere line up to bands one foot or more in thickness. The felspar likewise forms folia, and is usually orthoclase, but plagioclase is often associated with it. Frequently the quartz and felspar are intimately commingled. The mica (usually Muscovite) occurs in laminæ between the other minerals. In some varieties of gneiss the felspar occurs in lentil-shaped swellings, forming *augen-gneiss* ('eye-gneiss') or *porphyritic gneiss*. Varieties in composition are *hornblendic gneiss*, in which hornblende replaces mica; *protogine gneiss*, with talc instead of mica; *graphite gneiss*, with graphite in place of mica. Gneiss belongs to the great class of schistose rocks, and in many cases can be shown to be the product of the metamorphism of clastic rocks, such as greywacke. In other cases it has been proved that gneiss has resulted from the metamorphism of granite—the one rock passing gradually into the other. The coarser-grained gneisses belong chiefly to the Archæan System (q.v.), and concerning the origin of these geologists are still divided in opinion. The finer-grained varieties are met with in many regions which have been affected by local and regional metamorphism. See Metamorphosis.

Gneist, Heinrich Rudolf Hermann Friedrich von, jurist, was born in Berlin, 13th August 1816. He entered official life as assessor in the Superior Court (*Kammergericht*) in 1841, and was successively assistant-judge of the same court and of the Supreme Tribunal, until in 1850 he resigned this position in order to devote himself exclusively to teaching; for since 1844 he had held the chair of Jurisprudence in Berlin University. From 1858 he sat in the Prussian lower house as a National Liberal, and was also elected a member of the imperial parliament. His writings deal chiefly with constitutional law in England and Germany, and with politico-historical subjects, as *Die Bildung der Geschwornengerichte in Deutschland* (1849); *Adel und Ritterschaft in England* (1853); *Das heutige englische Verfassungs- und Verwaltungsrecht* (1857–63; 3d ed. 1876–84), his masterpiece; *Budget und Gesetz nach dem constitutionellen Staatsrecht Englands* (1867); *Die Stadtverwaltung der City von London* (1867); *Verwaltung, Justiz, Rechtsweg . . . nach englischen und deutschen Verhältnissen* (1869); *Englische Verfassungsgeschichte* (1882; Eng. trans. by Ashworth, 1886); *Das englische Parlament* (1886; Eng. trans. by Shee, 1886), and numerous works dealing with current questions of practical politics in Germany. He was ennobled in 1888, and died 21st July 1895.

Gnesen (Polish *Gniezno*), a Prussian town, situated in a region of hills and lakes, 31 miles ENE. of Posen by rail. It has a Catholic cathedral, dating from 965, and till 1320 was the coronation-place of the Polish kings. It came finally to Prussia in 1814. Pop. 18,088.

Gnetaceæ. See Sea Grape.

Gnidos. See Cnidos.

Gnome (Gr. *gnomē*), a pithy and sententious saying, commonly in verse, embodying some moral sentiment or precept. The gnome belongs to the same generic class with the proverb; but it differs from a proverb in wanting that common and popular acceptance which stamps the proverb, as it were, with public authority. The use of gnomes prevailed among all the early nations, especially the Orientals; and the literatures, both sacred and profane, of most countries abound with them. In the Bible the book of Proverbs, part of Ecclesiastes, still more the apocryphal book of Ecclesiasticus, and other books of the Old Testament contain many examples; and in the New Testament the familiar lessons of our Lord are frequently presented in this striking form. The Indian, the Arabian, and the Persian literatures also are rich in gnomes, as are those of the northern nations. But the most interesting form which they have taken is that in which we find them in Greek literature, in which the writers who have cultivated this form of composition are known as a distinct class—the Gnomic Poets (*gnomikoi*). The Greek gnome is commonly couched in the elegiac distich; and the most celebrated gnomic poet was Theognis of Megara, in the 6th century B.C. The remains of gnomic writers have been repeatedly edited under the title of *Gnomici Poetæ Græci*, from the days of Melanchthon downwards. Standard editions are those of Brunck (1784; new ed. 1817) and Gaisford (1820; new ed. 1823). See Proverbs.

Gnome. See Demonology.

Gnomon. When a rectangle is divided into four parts by cross lines parallel to its sides, the sum of any three of the parts is called the *gnomon*. For Gnomonic Projection, see Projection.—Gnomon has also a meaning in dialling (see Dial); and a gnomon, or style erected at right angles to the horizon, sometimes of great height, was much used by ancient astronomers for finding the altitudes and declinations of sun and stars.

Gnosticism. In the New Testament the *charisma* of *gnosis*, or the 'knowledge' of the mysteries of God, is distinguished from *sophia*, or practical religious 'wisdom' (cf. 1 Cor. xii. 8). This Christian *gnosis* was at first the natural product of theological reflection on the positive doctrines contained in the Gospel. A Jewish theology, based on the religious ideas of the Old Testament, was already in existence, and had received a powerful impulse from the combination of Greek philosophy with Hellenistic Judaism by Philo. The chief function of the earlier *gnosis* had been to discover the ideal value of the various religious histories, myths, mysteries, and ordinances, and to get behind the letter of the written word. In course

of time not only the Old Testament, but even the gospel history, was thrown into the melting pot, and alloyed with the philosophic doctrines of Jewish Hellenism, to produce a religious theory of the universe. There was a general tendency to trace the same religious idea through different mythologies (which were held to be the popular expression of religious ideas originally revealed), and the new religion which aimed at the redemption of the whole world was eagerly seized on as the embodiment of their unifying principle. Christianity was believed to be the full revelation of the deeper truth embedded in all the nature-religions. By adapting their presentation of Christianity to the form of the ancient mysteries the Gnostic teachers the more easily fastened themselves upon the Christian congregations, and succeeded in taking up a position within them as specially initiated persons, for which they found a natural support in the prevalent ascetic views and the powerful influence of free prophecy. In Syria and the East they imparted a distinctly Gnostic tinge to Christian teaching generally; in the Greek and Roman world they formed esoteric schools, which endangered the organisation of the Christian congregations ('they undermine ours, in order to build up their own'—Tertullian, *De Præscr. Hæret.* 42). But these were in time forced to separate themselves, and form sects, whose great diversity becoming the more apparent greatly counteracted the influence of the Gnostic leaven in the Christian communities. To maintain their theories in the face of the traditional doctrine of the churches they had recourse to the *sources* of that doctrine. They claimed to have special traditions from certain of Christ's disciples, and applied their exegetical skill to the allegorical interpretation of the written monuments of the apostolic age. The Gnostics, indeed, were the first New Testament exegetes, and the first who set the apostolic writings side by side with the gospel histories as authoritative Scriptures. Both in their interpretation and in their presentation of the texts they allowed themselves a free hand, omitting, adding, and sometimes forging, to suit their theories. Marcion (about 150), believing himself to be a consistent follower of Paul, rejected the authority of the earliest apostles, as well as the gospels emanating from the circles of their influence, and professed to hold 'the gospel' known to Paul only. His collection of ten epistles of Paul was the first attempt to fix the canon of the apostolic Scriptures. Such arbitrary treatment of the Scriptures led the church to resort to a more thorough study of the historical tradition. In the struggle with Gnosticism it obtained a firm hold of the principle that that alone is to be held true Christianity which can be shown to be historically derived from Christ and his apostles, and it found the only means to check the license of Gnostic speculation in the development of a Christian theology in accordance with the positive character of historical Christianity.

The general principles of Gnostic thought may be here summarised, as fuller accounts of the principal schools are given under their own names or under those of their founders. For the practical doctrine of the redemption of men's souls from sin by Jesus Christ the Gnostics substituted a speculative doctrine of the redemption of the human spirit from matter by religious knowledge. The realistic eschatology of the primitive church they entirely set aside. The evangelic element in their teaching was obscured by a cloud of heathen mythologies and philosophic subtleties. The Divine Demiurgos and Lawgiver of the Old Testament was distinguished from the Supreme Being, and the Hebrew idea of creation was superseded by that of a continuous process of emanations from the divine first cause. The present world was believed to be the result of a catastrophe in which the spirit fell under the power of matter, or of an original destiny that powers hostile to God should bring into existence a world in which the spirit born of God should be held in unwilling estrangement from him. All the Gnostic systems are more or less dualistic. In these dualistic theories a philosophical foundation was secured for the practical asceticism of primitive Christianity, which was by the Gnostics developed to an extreme. The highest duty of man was to become united to the First Source of Spirit through *gnosis* and the absolute alienation of the human spirit from the body. Others, like Carpocrates and his son Epiphanes, expressed their contempt for the flesh and the ordinances of the Demiurgos in unbridled license. The contrasts of the flesh and the spirit and of the world and the kingdom of God are interpreted as the physical conflict of vast cosmic forces, and are thereby stripped of their moral and religious significance. The intervention of Christ is the crisis, not only of the religious history of mankind, but of the whole development of the universe. As the final and perfect Æon he is distinguished from his visible manifestation. This is held to be either (1) a real human life with which he was connected for a time, or (2) a heavenly or 'psychical' creation, or (3) a mere phantasm. Men are divided into two classes: the *Pneumatic* or 'spiritual,' who are constitutionally receptive of Christ's revelation and life everlasting, and the *Hylic* or 'material,' who are doomed to perish. Valentinians and others add a third, or intermediate class, the *Psychical*, or men of 'soul,' who are not capable of apprehending a divine revelation, but only of the popular faith (*pistis*), yet thereby may attain to a degree of knowledge and salvation.

Various classifications of the Gnostic schools have been attempted. Matter arranged them according to their historical and national origin. Baur classified the different systems according to the degree in which they realised the idea of Christianity as opposed to Judaism and Paganism, and thus distinguished three principal schools: (1) that of Basilides, Valentinus, and others, who held the old faiths to be relatively valid developments of the religious consciousness; (2) that represented in the Clementines, where Judaism alone is recognised; and (3) that of the Ophites and the nobler teaching of Marcion, who found the perfect expression of truth in Jesus Christ. Neander's principle of division is the position which the different systems take up towards the God of the Old Testament: whether he is regarded as a subordinate deity, subservient to the supreme, or as eternally opposed to him, and therefore absolutely evil. Harnack distinguishes between Jewish-Christian and Gentile-Christian Gnostics, grouping the latter according to the greater or less divergence from the common Christianity which expresses itself in their various views of the Old Testament and the Demiurgos. The church fathers attributed the origin of Gnosticism to the demons, or (later) to ambition and insubordination to the episcopate. Hegesippus traced it to the Jewish sects; Irenæus and others to the influence of the Greek philosophers. They all believed that the first founder of the heresy was Simon Magus, who, with his confederate Helena, was held by the Samaritans to be an incarnation of the divine principle (Helena being his female counterpart, like the moon-goddess corresponding to the sun-god in Syro-Phœnician mythology). It is clear that about the beginning of the 2d century there were numerous teachers in Syria who endeavoured, not by the accepted allegorical interpretation, but by means of a negative criticism, to

adapt the Old Testament to their idea of a universal religion. Cerinthus held that Christianity was identical with pure Mosaism, laying great stress on part of the ceremonial law, and holding the creator of the world to be subordinate to the Supreme Being; others traced the ceremonial laws of the Old Testament to the devil, and held the God of the Jews to be the highest God. Others, again, entirely discarded Judaism, and connected their Christianity with allegorical interpretations of Syrian and Babylonian mythology. The chief representatives of Syrian Gnosticism were Saturninus (or Satornil) of Antioch, and the various sects of the Ophites (including the Naasenes, Peratai, and others). It is uncertain in what relation these isolated Syrian sects may have stood to the great Gnostic schools of Egypt and the West, the Basilidians and Valentinians. After the confederation of the Christian communities into the Catholic Church even these great schools were not long able to maintain a separate existence, and by the end of the first decade of the 3d century their ecclesiastical influence had well-nigh disappeared. But, though the organic energy of Gnosticism was thus quickly exhausted, Gnostic ideas held their ground to a much later date, and may be traced in the writings of some of the most highly reputed Christian fathers. The *Pistis Sophia*, edited by Schwartze and Petermann (Berlin, 1853), is the only Gnostic work that has come down to us in a complete form, except those apocryphal Gospels and Acts of the apostles which show a Gnostic tendency. Tatian's *Diatessaron* was used in the Syrian Church down to the 5th century. The Gnostic Bardesanes of Edessa, one of the last of the Syrian Gnostics, was the founder of Syrian hymnology.

See Neander, *Genetische Entwickelung der vornehmsten Gnostischen Systeme* (1818); Matter, *Histoire critique du Gnosticisme* (2 vols. 1828; 2d ed. 1843); J. A. Mohler, *Versuche über den Gnost.* (1831; also forming vol. i. of his *Gesamm. Schrift.*, ed. by Dollinger); Baur, *Die christliche Gnosis* (1835); Möller, *Geschichte der Kosmologie in der Griechischen Kirche bis auf Origenes* (1860); Lipsius, *Der Gnosticismus* (1860); King, *The Gnostics and their Remains* (1873); Mansel, *The Gnostic Heresies* (ed. by Lightfoot, 1875); Joel, *Blicke in die Religionsgeschichte zu Anfang des 2 Christlichen Jahrhunderts* (2 parts, 1880-83); Koffmanne, *Die Gnosis nach ihrer Tendenz und Organisation* (1882); Hilgenfeld, *Die Ketzergeschichte des Urchristentumes* (1884), with the Gnostic fragments, and lists of books relating to the various Gnostic teachers; Renan, *Origines du Christianisme* (vols. v. to vii.); Harnack, *Zur Quellenkritik der Gesch. des Gnost.* (1873) and *Dogmengeschichte* (vol. i., 2d ed. 1888); and for a concise account of the different systems, Möller, *Kirchengeschichte* (vol. i. 1889).

Gnu (*Catoblepas*), a genus of antelopes (termed *Wildebeest* by the Boers), of which the best-known species has been often described as apparently made up of parts of different animals, not only of the antelope and the ox or buffalo, but even of the horse. This species (*C. Gnu*) is a native of South Africa; it has disappeared from the more settled parts of Cape Colony, but is to be seen in herds on the arid plains beyond these boundaries in company with small troops of zebras, and with flocks of ostriches. The form and action of gnus so much resemble those of zebras and quaggas that at a distance they may be readily mistaken for them. The size of the gnu is that of a large ass; the general colour is yellowish-tawny. Both sexes have horns. The limbs are slender, like those of deer and antelopes. The gnu gallops with great speed. It has been usually represented as a very fierce animal, and certainly shows much ability to defend itself with its horns, when unable to escape from danger by flight; but when taken young it is easily tamed, and readily associates with oxen, accompanying them to and from the field. There are two or three species, all South African, nearly

Gnu (*Catoblepas Gnu*).

resembling the common gnu, and one considerably larger. Millais in *A Breath from the Veldt* (1895), reported that only 550 were left alive in South Africa, of which one herd were quite wild, and some were preserved by a wealthy Boer.

Goa, a Portuguese possession on the west coast of India, between the Western Ghâts and the sea, with an area of 1450 sq. m., and a pop. (1891) of 495,000. A hilly country, it is intersected by many small streams. Half of the land under cultivation, a third of the entire area, is devoted to rice; stately forests cover nearly a fourth of the remainder. The territory is divided for administrative purposes into two sections known as the Velhas and Novas Conquistas (Old and New Conquests), which are subdivided into nine 'provinces.' The chief civil and military authority is vested in a governor-general of Portuguese India, appointed by the king; he is aided by a general council, and by three subordinate juntas or councils. An archbishop, with the title of primate of the East, is at the head of the Roman Catholic Church; the native Christians constitute more than half of the total population, and the church's festivals are celebrated in Goa with great pomp. In 1871, in consequence of a rebellion, the native army was disbanded, and the colony is now held by a European force of little over 300 men; the police force is nearly 1000 strong. The revenue slightly exceeds the expenditure: the imports have long exceeded the exports. Captured by Albuquerque in 1510, 'Golden Goa' reached by the end of the century a pitch of military and ecclesiastical splendour and commercial prosperity such as finds a parallel in India only in the most brilliant days of the Mogul capitals. The decline of the Portuguese power quickly followed the appearance of the Dutch (see EAST INDIA COMPANY), and in 1759 the city of Old Goa, once the chief emporium of trade between the east and west, was deserted by all but its ecclesiastical inhabitants, and left to the decay in which it has since lain. Its one-time population of 200,000 has sunk to less than 1900; its arsenal, its palaces, its quays, even many of its churches are in ruins, their sites covered with cocoa-nut plantations, and the streets overrun with grass. Among the edifices that survive are the majestic cathedral, where services are held regularly every day, and the splendid church of Bom Jesus, containing the magnificent tomb which enshrined the remains of St Francis Xavier. The new capital is Nova Goa or Panjim, on the Mandavi, 3 miles from its mouth. It presents a picturesque appearance; its streets are wide and clean;

and new harbour and railway works were inaugurated in 1882. The public buildings include the viceregal palace and spacious barracks, one wing of which accommodates the national lyceum or college, the public library, and the Instituto Professional. There was a revolt in 1895, soon suppressed. Pop. 8440. See Fonseca's *Historical and Archæological Sketch* (1878), and Lady Burton's *Arabia, Egypt, India* (1879).

Goalanda, a market-town of Bengal, situated on a tongue of land at the confluence of the main streams of the Ganges and Brahmaputra, has become within a few years an important entrepot for the river trade, the terminus of the Eastern Bengal Railway, and the starting-point of the Assam steamers. Only temporary buildings are erected, as the floods of July have more than once swept away the more expensive masonry structures. Busy markets are held daily, and the river is crowded with native craft and fishing-boats. The population has grown from about 1000 in 1881 to over 10,000.

Goalpara, the most westerly district of Assam, on both sides of the Brahmaputra, and bounded on the north by Bhutan, with an area of 3897 sq. m., and (1891) 452,304 inhabitants. Earthquakes are common, and occasionally severe; the climate is regarded by both natives and Europeans as very unhealthy, especially during the rains.—Goalpara Town, on the Brahmaputra, is the only place in the district with over 5000 inhabitants. It has a considerable river trade. Pop. 5700.

Goat (*Capra*), a genus of ruminant ungulates, nearly allied to sheep. The horns, which consist of a solid core of bone and a horny sheath around this, differ from those of sheep in their position on the top of the head, in their backward curvature, and in being laterally compressed. They are roughened by transverse ridges, and are either keeled in front as in the common goat, or broad anteriorly and triangular in section as in the ibex. Though present in both sexes, they are larger (up to 3 feet) in the males, who use them as weapons in contests with rivals or foes. Goats are further distinguishable from sheep by the arched forehead, the straight nose, the beard on the chin, the short erect tail with little hair, the general absence of tear-pits and interdigital glands, the nature of the hair, which can hardly be called wool, and the disagreeable odour, which is especially strong during the breeding season. The curious, confident, *capricious* temperament of the goat is also different from that characteristic of sheep; but in regard to this and most of the other characters it must be allowed that they are not constant, and that the two types are very nearly allied.

Goats are confined to the mountainous parts of the Old World, where they are found throughout the south European alpine region, from Spain to the Caucasus, and thence onwards through Armenia and Persia to the Himalayas and China. With the exception of a Neilgherry goat and an Abyssinian ibex, they are confined to the palæarctic geographical region. Their remains are found in the Indian Pliocene, if not also Miocene deposits, and include a hornless form, *Bucapra daviesii*.

Goats are characteristically mountain-loving animals, climbing and leaping with marvellous dexterity. There does not seem sufficient warrant for believing the statement that the males of some species (e.g. *C. ægagrus* or *C. ibex*) are able to save themselves in falling from a height by bending the head inwards and alighting on the massive horns. They feed on herbage of many kinds, and are unfortunately fond of young shoots of trees. The herds are usually small; the old males are cross and combative; the old females are said to act in turn as sentries; the kids are very agile and graceful. The males differ from the females in having stronger horns, thicker manes, and in slight colour distinctions. The breeding season is in autumn; the gestation lasts five months; the birth is single or double; and the kids follow the mother a few days after birth.

Goats have highly developed senses of sight and smell, and are in many ways highly successful animals, swift in flight, bold in necessary attack, and well-adapted to their natural surroundings and mode of life. For general cleverness of climbing goats are deservedly famous, and in captivity they often exhibit daring and cunning. Romanes cites a case of one ringing a door bell when hungry for dinner, and two instances of the reasonable behaviour of two goats which met face to face on a narrow, rocky ridge, where the only action consistent with the life of both was that one should walk over the other, as accordingly happened. Their roguishness often suggests a faint sense of humour.

The common domestic goat is a variety of the Wild Goat (*C. hircus*) which inhabits the Taurus and other mountains of south-west Asia. Compared with its ancestor, the domesticated form is somewhat degenerate, being much reduced both in general size and as regards its horns. The domestication must have taken place at a very remote period, and spread from the East, probably through Egypt, westwards. A great number of breeds now exist, the pedigree of which has been of course complicated by varietal hybridisation, and it is at least possible that other species, such as the Grecian ibex, may in some cases have co-operated in the process. A most important variety, formed into a breed by artificial selection, is the Angora Goat (*C. hircus*, var. *angorensis*), where almost the whole body is enveloped in that long, silky, white hair which is so familiarly valuable and comfortable. The Angora goat has been introduced into Cape Colony, Australia, and the United States. The Cashmere Goat (*C. hircus*, var. *laniger*), from Tibet and Bokhara, is almost equally valuable, furnishing the white to brown hair used in making Cashmere wares. It has been successfully acclimatised in France. A third variety, utilised in the same way, is the Mamber Goat (*C. hircus*, var. *mambrica*), from Asia Minor and Tartary, distinguished by its long pendent ears. The Syrian goat, which also has long ears, is trained in the East to all manner of tricks—especially to balance itself on a slender pile of small wooden blocks, built up to a height of several feet.

The Bezoar Goat, Grecian Ibex, or Paseng (*C.*

The Bezoar Goat (*Capra ægagrus*).

ægagrus), which ranges from the Greek Archipelago to Persia, was once in great repute on account of the supposed medicinal virtue of round

concretions (or Bezoar balls, see BEZOAR) formed, as in many other ruminants, in the stomach. This is the wild goat that Homer refers to in connection with the Cyclops and Crete. The horns of the males bear strong tubercles in front; the beard is much developed; the general colour is reddish-brown, with dark stripes here and there.

The Markhor (*C. falconeri* or *megaceros*), from Tibet, Cashmere, and Afghanistan, is a strong, powerful goat, with corkscrew horns, much larger in the males, which are also distinguished by a thick mane on the neck and breast. Hunters credit it with killing and even eating serpents. Attempts at taming it in Europe have not been rewarded with much success.

The Alpine Ibex, or Steinbock (*C. ibex*), is typical of numerous goats which some separate off as a distinct genus. The chief difference is that the horns are broad in front, triangular in section, without a keel, but with a series of anterior transverse ridges. Different kinds frequent the lofty mountains of Europe and West Asia—*C. hispanica* or Izard in the Sierra Nevada, *C. pyrenaica* in the Pyrenees, *C. caucasica* in the Caucasus; but the distinctions are trivial, if not merely varietal. The Alpine ibex is a magnificent goat, without beard, but with very strong, slightly divergent, much-ridged horns. It used to be abundant, but through over-hunting, both for sport's sake and on account of supposed medicinal virtues, has become nearly extinct. Victor Emmanuel saved it in fact just in time by strict preserving, and small herds, amounting in all to about 300, still live on the heights between Piedmont and Savoy, especially in the Val-de-Cogne. Attempts at reintroduction have not been successful; in captivity the animals tend to become vicious, and the same is markedly true of hybrids between it and the common goat. In its native haunts it is said 'to surpass even the chamois in the certainty with which it estimates distances for extraordinary leaps.'

Goats can be kept with advantage in situations too rocky, or where the herbage is too scanty, for oxen or sheep. They were formerly kept in greater numbers in Britain than they now are. The goat is capable of the most perfect domestication, and becomes extremely attached and familiar. It is apt, indeed, to prove a troublesome pet, and makes use of its horns, although not angrily, much more freely than is at all agreeable. Goat and sheep may be successfully crossed, and the hybrids are to a certain extent fertile among themselves.

The uses of the goat are numerous. The flesh is good; that of the kid, or young goat, is in most countries esteemed a delicacy. Requiring but little attention, and able to subsist on rough diet, the goat is in many countries 'the cow of the poor.' The milk is very rich and nutritious, more easy of digestion than that of the cow, and often useful to consumptive patients. Some goats yield as much as four quarts of milk daily, although the average quantity is more nearly two. Both cheese and butter are made of goats' milk; they have a peculiar but not disagreeable flavour. Goats' milk is still very much used in Syria and other parts of the East, as it was in the days of the patriarchs. The skin of the goat was early used for clothing, and is now dressed as leather for many uses, particularly for making gloves and the finer kinds of shoes (see GLOVES). The hair, which may be advantageously clipped annually, is used for making ropes which are indestructible in water, and for making wigs for judges, barristers, and other functionaries. For the latter purpose the hair of white goats is used. Especially valuable of course are the Angora and Cashmere varieties. The horns are used for making knife-handles, &c., and the fat is said to be superior to that of the ox for candles. Goats are sometimes employed in drawing children's coaches, to which as many as four are sometimes harnessed together, and they are sufficiently tractable and obedient to the rein.

But the economic importance of the goat is not altogether on the side of utility. It ruins young plantations and makes reforesting in some cases impossible. According to Carl Vogt, the legend that the devil created the goat is justified by the animal's pernicious influence: 'It is the most destructive creature in the world in forests, and the old seats of civilisation—viz. the countries round the Mediterranean—owe the destruction of their forests, the nakedness of their mountains, and the inevitable consequence of that condition, the dryness of their climate, to the devastations of these animals.' In the same connection it may be noted that the goat, as destructive of the vine, was sacrificed in ancient times to Bacchus. Spain has about 4,000,000 domestic goats; Germany, Greece, and Italy each some 2,000,000. See ANGORA GOAT, ANTELOPE, ARTIODACTYLA, CASHMERE GOAT, SHEEP. The Rocky Mountain Goat (q.v.) is an antelope rather than a goat. The izard is the ibex of the Pyrenees. See Pegler's *Book of the Goat* (new ed. 1886).

Goat-moth (*Cossus ligniperda*), a large moth common throughout Europe and Asia. It measures three inches or more across the wings, and has a thick heavy body. The general colour is yellowish-gray; the upper wings are mottled with white, and marked with many irregular black lines; the lower are of an almost uniform ash-colour. The caterpillar is about three inches long when full-grown, and has a yellowish colour, the upper parts flesh-like, the head black. It inhabits and feeds on the

Caterpillar, Chrysalis, and Imago of the Goat-moth (*Cossus ligniperda*).

wood of willows, poplars, and elms, making holes large enough to admit a finger, and often causing the destruction of the tree. Its size, abundance, and voracity make it a formidable devastator of trees. When alarmed or handled it emits a disagreeable goat-like odour, which cannot be removed from the hands even by frequent washings. It takes two or three years to attain maturity. The reddish-brown pupa is enclosed in a cocoon of chips cut by the jaws of the creature. The caterpillar has been regarded by some as the *cossus* of Roman epicures, but this was more likely the larva of some large beetle.

Goat's Beard (*Tragopogoa*) is a genus of plants of the natural order Compositæ. The common Goat's Beard (*T. pratense*), also known by

the name *Go-to bed at noon*, from the circumstance of its closing its flowers about mid-day, is an abundant native of Britain. The plant is erect, the flower stems about 18 inches high, the root leaves 5 to 8 inches long, stem leaves shorter, with a dilated base, glabrous and slightly glaucous. The peduncles are long, thickened at the summit, and the flower-heads yellow. It is biennial, and the roots, if taken before the flower-stems shoot up, and boiled, resemble asparagus in flavour, and are said to be nutritious. In some parts of France the fresh juice of the young stems and leaves is believed by the common people to be an excellent solvent of bile. Salsify (*T. porrifolium*), also a native of Britain, is cultivated in gardens for the sake of its esculent roots, which are esteemed by some.

Goat's Rue (*Galega*), a genus of Leguminosæ, of which one herbaceous perennial species (*G. officinalis*) is sometimes cultivated like lucerne (especially in Switzerland) as a forage plant, on account of the great bulk of produce which it yields. Its peculiar smell is not relished by cattle unaccustomed to it. It was formerly also employed in medicine, but is now seldom heard of beyond the herbaceous flower border.

Goatsucker, or NIGHT-JAR, a name applicable to any member of the family Caprimulgidæ, allied to the swifts, included among the Passerine birds. They are almost cosmopolitan, nocturnal, superficially owl-like birds, with soft, mottled, predominantly brown and gray plumage, feeding usually on insects which they catch on their swift, silent flight, and notable for their eerie, often almost human like cries, which have awakened superstitious dread in the natives of all countries. The bill is short, with the upper part curved at the point, but the gape is extremely wide, and enclosed by a fringe of strong bristles borne along the margins of the beak. The eyes are very large and full; the hind toe can be directed forwards; in the great majority (Caprimulginæ) the middle claw is a curious comb; the second pectoral muscle is long; the oil-gland is small; there are after-shafts to the feathers.

The only constant British species is the night-jar, night-hawk, fern owl, churn owl, or night-churr (*Caprimulgus europæus*), which stays from May to September, frequenting uncultivated, fern-covered ground or bushy places throughout the

The Night-jar (*Caprimulgus europæus*).

country. With twisting flight and 'whirring' wings it hawks for insects in twilight or darkness, but will also bask in the sun. On a branch it sits lengthways, with the head low down, and when stationary the male utters his well-known 'churr.' With the comb-like middle claw a night-jar in captivity has been seen to scratch the ground, but what it usually does with this instrument is uncertain. The plumage is gray, brown, and buff; the length about 10 inches. The eggs (two) are laid on the ground without a nest, and are 'creamy white, marbled and veined in endless variety with brownish-black and purplish-gray.' The bird is widely distributed in Europe, North Africa, and as far east as North-west India. 'One of its lines of migration from Africa crosses Malta, where large numbers are shot for the table in spring.' Two other species of night-jar (*C. ruficollis* and *C. ægyptius*) are noted by Howard Saunders as having occurred in Britain. See his *Manual of British Birds*.

Among the interesting members of the family, which includes about seventeen genera and ninety species, may be noted the Pennant-winged Night-jar (*Cosmetornis vexillarius*) and the Lyre-tailed Goatsucker (*Macropsalis lyra*), with elongated feathers on wings and tail respectively (see also WHIP-POOR-WILL). The South American genus Nyctibius differs from the ordinary goatsuckers in several particulars—e.g. in having a smooth middle claw. It seems to connect them with the family of Podargidæ, the members of which—e.g. the 'frog-mouths' (Batrachostomus)—have a gape even wider than that of goatsuckers. Allied also is the peculiar South American Oil-bird or Steatornis (see GUACHARO). The family of Rollers (q.v., Coraciadæ) is also nearly related.

The weird and often almost articulate cries of the goatsuckers—'who are you,' 'work away,' 'willy-come-go,' 'whip-poor-will,' &c.—have earned for the birds the reputation of auguring evil, while a more curious, and yet quite explicable popular notion is expressed in the modern title 'goatsucker,' or in Pliny's name *Caprimulgus*, or in Aristotle's *Aigothelas*. The notion suggested by these words is that the birds suck the milk of goats, as Pliny definitely states. The truth and the origin of the mistake may be best expressed in Waterton's words: 'These innocent little birds never suck the herds; for when they approach them, and jump up at their udders, it is to catch the flies and insects there.' The animals are sensible of the birds' good offices, for they stand quietly and 'do not try to drive them off as uncivil intruders.' See Waterton's *Wanderings in South America*.

Gobbe, or VOANDZOU (*Voandzeia subterranea*), a leguminous annual of tropical Africa (sub-order Cæsalpineæ), of which the young pod is thrust into the ground in the same manner as that of *Arachis hypogæa* (the Ground-nut, q.v.), thus at once protecting and planting the seeds. The rich oily seeds ('Angola peas') are wholesome and agreeable when boiled. The young pods also are used like French beans.

Gobbo, GOBBIO, or GOMBO. See HIBISCUS.

Gobelins, the name of a family of dyers, who in the 15th century established themselves in the Faubourg St Marcel, Paris. In the following century they added to their dyeworks a tapestry manufactory. In 1662 the establishments were purchased by Colbert, Louis XIV.'s minister, and reorganised as royal upholstery works, celebrated painters, such as Le Brun and Vouet, being employed to furnish designs. From the year 1697 the tapestry manufacture alone was carried on, the product of the looms being known by the name of Gobelins. The works were closed during the Revolution and down to the restoration of the Bourbons, but since that time they have again been in active operation. A second establishment for the manufacture of Gobelins, likewise supported

by the state, exists at Beauvais. For other textiles of a similar description, see TAPESTRY.

Gobi, DESERT OF. See ASIA (Vol. I. p. 486), DESERT.

Goblin (Fr. *gobelin*, Low Lat. *cobalus*, Ger. *kobold*, Gr. *kobalos*), a mischievous sprite, also called *Hobgoblin*. See DEMONOLOGY, BROWNIES.

Gobony, or GOBONATED. See BORDURE.

Goby (*Gobius*), a genus of carnivorous shore fishes, abundant on all temperate, and yet more on tropical coasts. The genus is type of a family, Gobiidæ, included among the acanthopterous bony fishes. The gobies are generally small; the bodies are scaly; of the two dorsal fins, the anterior has usually six flexible spinous rays; the ventrals are united to form an adhesive disc, by means of which the fishes cling to the rocks, withstanding the rush of the waves; there is no swim-bladder. Their favourite habitat is on rocky coasts; 'many,' Günther says, 'seem to delight in darting from place to place in the rush of the water which breaks upon the shore;' others live in brackish water, and not a few have become acclimatised in lakes. In various degrees the gobies change their colour to

The Black Goby (*Gobius niger*).

suit the ground on which they rest. The males of some species build nests of seaweeds and sea-wrack, and watch these jealously till, and even after, the hatching of the eggs which their mates have laid.

The genus includes about 300 species, of which several are common on British coasts. Of the latter the Black Goby (*G. niger*) is the largest, but only measures 5 or 6 inches; *G. ruthensparri*, *G. minutus*, *G. paganellus*, are other well-known species. They make interesting inmates of aquaria. The White Goby (*Latrunculus albus*) is a very small transparent fish, found on some British and European coasts, remarkable as 'the first instance of an annual vertebrate,' for it seems only to live one year. There are numerous genera very nearly related to Gobius, while not far off is the genus Periopthalmus, the members of which have greatly protruded eyes and are accustomed to hunt along the ebb-tide shore, hopping and leaping with some agility. The Dragonets (q.v.) are also allied. See Günther's *Study of Fishes* (Edin. 1880).

God. See RELIGION, THEISM.

God'alming, a municipal borough of Surrey, 34 miles SW. of London. Hither in 1872 the celebrated school of Charterhouse (q.v.) was removed from London. Pop. 2505.

Goda'vari, one of the principal rivers of India, and the largest of the Deccan, rises within 50 miles of the Indian Ocean, and flows south-east across the peninsula into the Bay of Bengal, which it enters by seven mouths, after a course of 898 miles, its total drainage area being estimated at 112,000 sq. m. For some miles before the river bursts through the barrier of the Eastern Ghâts, its picturesque scenery has earned for it the name of the Indian Rhine; its stream, which, after receiving the Manjera, the noble Pranhita, the Indravati, Tal, and Sabari, has attained a breadth of from one to two miles, is here contracted by precipitous banks, until the whole volume of water pours through a rocky gorge 200 yards wide. The magnificent *anicut* or dam at the head of the delta, throwing off three main canals with a distributing length of 528 miles, deserves notice; thus irrigated, the entire delta has been turned into a great garden of perennial crops. The navigation of the upper waters is impeded by three impassable rocky barriers or rapids within a space of 150 miles; the works undertaken in 1861 to remove these obstructions, or to pass them by means of canals, were abandoned ten years later. The Godavari is one of the twelve sacred rivers of India, and the great bathing festival, called *Pushkaram*, is held on its banks once in twelve years. The *district* of Godavari embraces the delta; chief town, Cocanada.

Goddard, ARABELLA, pianist, was born near St Malo, in Brittany, in 1836, and received lessons from Kalkbrenner, Thalberg, and Macfarren. She made her début at the Grand National Concerts in London in 1850, and in 1854–56 performed with great success in the principal cities of France, Germany, and Italy. In 1860 she married Mr Davison (1813–85), *Times* musical critic. After her farewell to the British public in 1873, she made a tour in the United States, returning to England in 1876.

Goderich, a port of Ontario, on Lake Huron, 160 miles WNW. of Buffalo by rail, with eight salt-wells. Pop. (1891) 3839.

Goderich, VISCOUNT, a British statesman, afterwards Earl of Ripon (q.v.), who was head of the short-lived Goderich administration (1827–28).

Godesberg, a village of Rhenish Prussia, on the Rhine, 4 miles S. of Bonn, with a mineral spring, and a ruined castle (1213). Pop. 3901.

Godet, FRÉDÉRIC, theologian, was born at Neuchâtel in Switzerland, October 25, 1812, studied there and at Berlin and Bonn, and after having been tutor to the Crown-prince of Prussia and held minor cures, he became in 1850 professor of Theology at Neuchâtel. In 1873 he left the state church and was appointed professor by the Free Church of Neuchâtel. He resigned in 1877. He is best known for his great commentary on St John's Gospel (1863–65; 3d ed. 1881–85; Eng. trans. 1877), followed by commentaries on Luke (trans. 1875), Romans (trans. 1881), and Corinthians; *Conférences Apologetiques*, *Études Bibliques* (trans. as *Old Testament Studies* and *New Testament Studies*, 1875–76), and a work on the theology of the New Testament (1893). He died 29th October 1900.

Godfather and **Godmother** (also called Sponsors), the persons who, by presenting a child for the sacrament of baptism, which is regarded as a new spiritual birth, are reputed to contract towards the newly baptised the relation of spiritual parentage. In the Roman Catholic Church this spiritual relationship is regarded as a species of kindred (whence the name *gossip*, or *God-sib*, 'spiritually akin'), and constitutes an impediment of marriage between the sponsors upon the one hand and the baptised and the parents of the baptised on the other. Anciently, this impediment arose also between the sponsors themselves; and it still extends much further in the Eastern than in the Western Church, although in the former it can arise only from baptism, whereas in the Roman Church the candidate for confirmation also is presented by a sponsor, though usually one of the same sex.

In the Anglican Church, by whose rule two godfathers and a godmother are required at the baptism of a male, and two godmothers and a godfather at that of a female, no impediment of marriage arises from the relation of the sponsors to the baptised. The parents of the baptised are not permitted to act as sponsors in the Roman Catholic Church, one

of the objects of the institution being to provide instructors in case of the death of parents; but the present rule of the Church of England, following the rubric of the American Prayer-book, does so allow.

Godfrey, Sir Edmundbury. See Oates (Titus).

Godfrey of Bouillon, a typical representative of Christian chivalry, was born about 1061, at Baisy, a village of Belgian Brabant, the eldest son of Count Eustace II. of Boulogne, and Ida, sister to Godfrey, Duke of Lower Lorraine and Bouillon. He served with great gallantry under the Emperor Henry IV., both against Henry's rival, Rudolph of Swabia, and in 1084 in the expedition against Rome. Five years later the emperor invested him with the duchy of Lower Lorraine. Godfrey joined the first crusade, and was elected one of the principal commanders. For an account of his career in the East up till the taking of Jerusalem, see Crusades. Eight days after the capture of the Holy City Godfrey was proclaimed king by the crusading army; but his piety and humility forbade him to 'wear a crown of gold where his Saviour had worn one of thorns.' He accordingly contented himself with the title of Defender and Guardian of the Holy Sepulchre. On 12th August 1099, on the plain of Ascalon, Godfrey defeated the sultan of Egypt; this victory put him in possession of the whole of Palestine, a few fortified towns only excepted. After a year spent in organising his new state, Godfrey died, 18th July 1100. See De Hody, *Godefroid de Bouillon* (2d ed. Tournai, 1859); and Froboese, *Gottfried von Bouillon* (Berlin, 1879).

Godfrey of Strasburg. See Gottfried.

Godiva, Lady, the famous patroness of Coventry, who built herself an everlasting name by an unexampled deed of magnanimity and devotion. About the year 1040 Leofric, Earl of Mercia and Lord of Coventry, imposed certain exactions upon the inhabitants, hard and grievous to be borne. His wife, the Lady Godiva, besought her husband to give them relief, and pleaded so earnestly that, to escape from her importunities, the earl said he would grant her the favour, but only on the impossible condition that she would ride naked through the town. Godiva ordered proclamation to be made that on a certain day no one should be in the streets, or even look from their houses, when, 'clothed on with chastity,' she rode through the town; and her husband, in admiration of her intrepid devotion, performed his promise. This circumstance was commemorated by a stained-glass window, mentioned in 1690, in St Michael's Church, Coventry; and the legend that an unfortunate tailor, the only man who looked out of a window, was struck blind, has also found commemoration in an ancient effigy of 'Peeping Tom of Coventry,' still to be seen in a niche of one of its buildings. The story occurs in most chroniclers who deal with the time of Edward the Confessor, although it is true that there is no narrative of it earlier than three centuries after. The earliest version is that in the English chronicle usually ascribed to Brompton (close of 12th century), quoted in Dugdale's *History of Warwickshire*, and followed with some variations by Matthew of Westminster, and Higden. Cox makes bold to connect Peeping Tom with the universally spread story of the Master-thief, and notes that the story of Godiva, slightly altered, is told again in the tale of Allah-ud-deen (*Thousand and One Nights*), who sees through a crevice the king's daughter on her way to the bath, when it is death for any one to be seen abroad or to be found looking at her. Part of the civic procession at the opening of the great fair of Coventry used formerly to be a representation of the ride of Lady Godiva. It continued at intervals of from three to seven years, until 1826, and was revived with great splendour in 1848. But the ceremony has now fallen into disrepute, and such attempts as have been made to revive it have not commended themselves to the best citizens of Coventry. There is a poor ballad on the subject entitled 'Leofricus' in the Percy Folio MS., and in the *Collection of Old Ballads* (1726). The story has been gracefully re-told by Leigh Hunt, and in noble verse by Tennyson. See Felix Liebrecht's *Zur Volkskunde* (1879), and a study by E. Sidney Hartland in the *Folklore Journal* for 1890.

Gödöllö, a market-town of Hungary, 15 miles NE. of Pesth, with a royal castle and park presented by the Hungarians in 1867 to their king, the emperor of Austria-Hungary. Here, on 7th April 1849, the Austrian forces were defeated by the Hungarians. Pop. 4940.

Godolphin, Sidney Godolphin, Earl of, who under four sovereigns occupied a seat at the Treasury Board, and under Anne filled the office of Lord High Treasurer *solus*, was descended of good English family, and was born at Godolphin Hall, near Helston, in the extreme south of Cornwall, in the summer of 1645—he was baptised on 15th July. Introduced at court as a royal page in 1664, he four years later accompanied his kinsman Sir W. Godolphin on a mission to Spain. But his first important public work was performed as envoy-extraordinary to the Netherlands in 1678, where he became acquainted with the Prince of Orange and with Sir William Temple. After his return to England he secured a seat in the House of Commons, and in 1679, on the recommendation of Temple, was appointed a commissioner of the Treasury. Although he voted for the Exclusion Bill, he was nevertheless in 1684 made First Commissioner of the Treasury, and also elevated to the peerage. On the accession of James II. Godolphin was indeed removed from the Treasury, but received compensation therefor in the appointment of chamberlain to the queen. His services as an administrator of the finances of the kingdom were, however, valued so highly that in 1686 he was recalled to the Treasury. On William of Orange's landing in 1688 Godolphin stood firmly by James, and was left, along with four others, in charge of the government when the king fled from London. He was also chosen, along with Halifax and Nottingham, to treat with William; and, when James's flight from the country was known, Godolphin was one of those who voted for a regency. Yet no sooner was William proclaimed king than, on 14th February 1689, he reinstated Godolphin in his old quarters as First Commissioner of the Treasury. Godolphin was a Tory; and, when William began to replace his Tory ministers by Whigs, the turn came to Godolphin—but came last, in 1696—to go likewise. In 1700, however, he once more returned to his old place; yet he only held office on this occasion for about six months. When Anne succeeded to the throne she made Godolphin (on 6th May 1702) her sole Lord High Treasurer. This position he filled down to 1710. The personal friend of Marlborough, he steadily supported the great general all through the war, enabling him by his thrifty and able management of the finances to conduct one brilliant campaign after another without suffering embarrassment from lack of supplies. And this feat Godolphin was able to achieve without increasing the public debt by more than about one million sterling annually—a most eloquent witness to his ability, sagacity, and sound administrative talents. He warmly advocated the union

between England and Scotland, which was indeed effected before he laid down the staff of office. As Harley's friend and relative, Mrs Masham, crept further and further into the good graces of Anne, Harley himself began to prove more and more a thorn in the flesh to Godolphin. At length the latter, to prevent his own overthrow, constrained Anne to dismiss Harley. Godolphin's behaviour at this juncture, and his attitude towards the sovereign, mark the transition from the old order of things, when the king (or queen) appointed his own ministers, and dismissed them, according as he thought fit, and the new order of things, under which the ministers are appointed by the chief adviser of the crown. And they likewise foreshadow the methods of party government which took firmer shape later on in the century. But the dismissal of Harley was the prelude to his own; for, the influence of Mrs Masham continuing to increase, and the power of Harley to grow in a corresponding degree, Godolphin's necessarily diminished, and on 8th November 1710 he was curtly dismissed by Anne. He only survived about two years, dying on 15th September 1712 at Holywell House, Marlborough's seat, near St Albans. He was married for three years (1675–78) to Margaret Blague, the excellent lady whom Evelyn knew, and whose life he wrote. Godolphin was neither a brilliant man, nor an eloquent speaker, nor a great statesman; but rather a sagacious, cautious, very able administrator. He was not a man of strong political bias, and in his day it must be remembered political parties were not what they are at the present time. As an excellent official of the Treasury he doubtless saw no reason why he could not serve equally well whoever happened to be master of the land for the time being. At all events, he was an incorruptible official, though some have doubted whether he was not a double-dealing politician, and some have indeed accused him of being such. In private life, at least in his later years, he was fond of horse-racing and gay life. See the Hon. Hugh Elliot, *Life of Sidney, Earl Godolphin* (1888).

Godoy. See ALCUDIA.

God save the King. See NATIONAL HYMNS.

God's Truce. In the 9th and 10th centuries, when the empire of Charlemagne had begun to break up into small fragments—countships, dukedoms, baronies, &c.—the right of private war and private vengeance, which had been traditionally practised by the early Teutonic races, threatened to become a source of anarchy and dissolution, instead of what it was intended to be, a rough and ready method of enforcing equity between man and man. Accordingly the church, as the guardian of justice and the preserver of moral order, stepped in, and at the end of the 10th century formulated stern ecclesiastical penalties against all who, whilst waging feudal war, should violate the peace of churches, priests, and the tillers of the soil. The God's Truce, technically speaking, was a mutual agreement, confirmed and sanctioned by the church, on the part of the barons and nobles of a particular district, to abstain altogether from private war on and between certain fixed days and times, and to respect permanently the rights and liberties of those who followed purely pacific callings. This movement had its origin in the south of France, having been first set on foot at a synod held at Tuluges, in Roussillon, in 1027. Fourteen years later it embraced the whole of France; and from there it spread rapidly into Germany, Italy, Spain, and England. About 1041 the main provisions of the Peace of God (*treuga Dei*) were these: Peace was to last from Wednesday evening to Monday morning in each week, also during Advent and Lent, and on certain of the principal saints' days and holy days of the church; the punishments for contumacy and disobedience were money fines, banishment for a long term of years, and excommunication; protection was specially extended to all women, pilgrims, priests, travellers, merchants, and agriculturists, and also to the farm implements and live-stock of the peasantry. The Peace of God was confirmed by several councils of the church, more especially by that of Clermont (1095), when Urban II. proclaimed its universal extension throughout Christendom. With the gradual consolidation of the kingly power in the larger monarchies during the course of the 13th century this institution fell into desuetude. See Semichon, *La Paix et la Trève de Dieu* (2d ed. 1869).

Godunoff. See RUSSIA, p. 44.

Godwin, Earl of the West Saxons, the greatest Englishman in the first half of the 11th century, was most probably son of the South-Saxon Wulfnoth, who was outlawed in 1009, and regained his father's lands by his conduct in the contest with Canute; but according to others his father was merely a churl, and Godwin found means to ingratiate himself with Earl Ulf, the brother-in-law of King Canute. At anyrate, by 1018 he was an earl, and the year after he married the daughter of Ulf, and soon became Earl of the West Saxons. In 1042 he took the foremost part in raising Edward to the English throne, and was rewarded by the marriage of his beautiful daughter Edith to the English king—a union which, however, turned out unhappily. Godwin had to lead the struggle against the worthless king's fondness for foreign favourites, and thus drew upon himself the violent enmity of the court party. With more than feminine bitterness and spleen, the unmanly king revenged himself by heaping insults upon Queen Edith, seized her dower, her jewels, and her money, and, allowing her only the attendance of one maiden, closely confined her in the monastery of Wherwell. Godwin and his sons were banished, but they contrived to keep alive the antipathy of the English to the Norman favourites of Edward, and in the summer of 1052 landed on the southern coast of England. The royal troops, the navy, and vast numbers of the burghers and peasants went over to Godwin; and finally the king was forced to grant his demands, and replace his family in all their offices. Godwin died 7th April 1054. His great-hearted son Harold was for a few months Edward's successor on the throne. See the appendices to vols. i. and ii. of Freeman's *History of the Norman Conquest*.

Godwin, FRANCIS, was born at Hannington in Northamptonshire in 1562, son of the Bishop of Bath and Wells. Elected a junior student of Christ Church, Oxford, in 1578, he graduated in 1580, next took orders, and was in succession rector of Sampford and vicar of Weston-Zoyland, both in Somersetshire. With Camden he journeyed through Wales in 1590. Already sub-dean of Exeter in 1587, he was made in 1601 Bishop of Llandaff for his *Catalogue of the Bishops of England*, and was translated to Hereford in 1617. He died in 1633. His name is now remembered, not for his *Rerum Anglicarum Annales* (1616), but for his fanciful story, *The Man in the Moon, or a Discourse of a Voyage thither, by Domingo Gonsales*. It was translated into French and imitated by Cyrano de Bergerac, who in his turn undoubtedly influenced the voyage to Laputa episode in Swift's *Gulliver's Travels*. Godwin's *Nuncius Inanimatus in Utopia* (1629, but soon suppressed) must have suggested Wilkins' well-known *Mercury, or Swift and Secret Messenger*.

Godwin, MARY WOLLSTONECRAFT, the protomartyr of the Rights of Women, was born at Hoxton, 27th April 1759. Of Irish extraction, she was the second of six children; her father, Edward John Wollstonecraft, a drunken ne'er-do-weel, who squandered £10,000, and was always shifting about—to Edmonton, Barking, Beverley, Hoxton once more, next Laugharne in Carmarthenshire, and Walworth. At nineteen Mary went out to earn her own livelihood, and for ten years was a companion at Bath, a schoolmistress at Newington Green, and governess in Lord Kingsborough's family at Mitchelstown, Dublin, and Bristol. Of those ten years the chief events were her mother's death (1780); the flight of a sister, with Mary's help, from a brutal husband (1784); and a visit to Lisbon to nurse a dear dying friend (1785). Then in 1788, about which time she gave up church going, she turned translator and literary adviser to Johnson, the London publisher, who the year before had paid her ten guineas for her *Thoughts on the Education of Daughters*. In this capacity she became acquainted, not only with the literati of the day, but with reformers—Paine, Priestley, and the painter Fuseli. That acquaintance bore twofold fruit. On the one hand, in 1791, she produced her *Answer to Burke's Reflections on the French Revolution*, and in 1792 her *Vindication of the Rights of Woman*, a book, dedicated to Talleyrand, which made her both famous and infamous. On the other hand her friendship for Fuseli ripened into love, and 'to snap the chain of this association' (for Fuseli was a married man) she started alone for Paris in the winter of 1792. There, as a witness of the 'Terror,' she collected materials for her valuable but never finished *Historical and Moral View of the French Revolution* (vol. i. 1794); and there, in April 1793, she met Captain Gilbert Imlay, an American timber-merchant, the author of *A Topographical Description of the Western Territory of North America* (1792). In April 1794 at Havre she bore him a daughter, Fanny; in November 1795, after a four months' visit to Scandinavia as his 'wife' and accredited agent, she tried to drown herself from Putney Bridge. Imlay, whom she adored, had cruelly deserted her. But soon she resumed her old tasks; soon, in nine months' time, she was living, or rather not living, with Godwin, for both kept their separate lodgings in Somers-town. They had first met in 1791. On 30th August 1797, five months after their marriage, she gave birth to a daughter, Mary; on 10th September she died. In 1851 a railroad threatened her willow shaded grave in Old St Pancras' churchyard, so her remains and Godwin's were removed to Bournemouth.

The *Vindication*, whose text is the equality of the sexes, is a curious medley of genius and turgidity, religion and over-outspokenness; it was years in advance of its age, if only in its advocacy of government day-schools. We may like or dislike the writer; we cannot but love the woman, for the love that all children bore her, for her own steadfast love towards her two ingrate sisters, and for the loveliness, pure and pensive, of her face—we know it by Opie's canvas.

Among her other writings were *Original Stories for Children* (1791; illustrated by Blake), *Letters written during a Short Residence in Sweden, Norway, and Denmark* (1796), and *Posthumous Works* (4 vols. 1798), these last comprising *The Wrongs of Woman, or Maria, a Fragment*, and the passionate *Letters to Imlay* (new ed., with memoir, by C. Kegan Paul, 1879). See, too, the Memoirs by Godwin (1798) and Mrs Pennell ('Eminent Women' series, 1885).

Godwin, WILLIAM, political writer and novelist, was born 3d March 1756 at Wisbeach, but passed his boyhood at Guestwick in Norfolk. He was the seventh of thirteen children. His father (1723–72) was a dissenting minister, by Godwin's showing a featureless precisian; the mother, we know from her letters, was a homely, good, lovable woman. After three years at Hindolveston day-school, three more with a tutor at Norwich, and one as usher in his former school, Godwin in 1773 entered Hoxton Presbyterian College; in 1778 quitted it as pure a Sandemanian and Tory as he had gone in. But during a five years' ministry at Ware, Stowmarket, and Beaconsfield, he turned Socinian and republican, and by 1787 was a 'complete unbeliever.' Meanwhile he had taken to literature, in 1783–84 writing three novels for £42, a Life of Chatham, and *Sketches of History, in Six Sermons*, with a good deal of subsequent hackwork. The French revolution gave him an opening, and his *Enquiry concerning Political Justice* (2 vols. 4to, 1793), brought him fame and a thousand guineas. It was calmly subversive of everything (law and 'marriage, the worst of all laws'), but it preached down violence, and was deemed caviare for the multitude, so its author escaped prosecution. *The Adventures of Caleb Williams* (1794) was designed to give 'a general review of the modes of domestic and unrecorded despotism, by which man becomes the destroyer of man;' unlike most novels with a purpose, it is really a strong book, one that will not be forgotten. Holcroft, Horne Tooke, and ten others were charged at this time with high-treason; Godwin's powerful defence of them in the *Morning Chronicle* did much to break down the charge. Holcroft was one of his oldest and most intimate friends, whose circle at different times included (or excluded) the publisher Johnson, Dr Parr, Thomas Wedgwood, Coleridge, Wordsworth (q.v.), Mackintosh, Lamb, Hazlitt, Mrs Inchbald, Mrs Opie, Mrs Siddons, Shelley, and Bulwer Lytton. Through Johnson it was that Godwin met Mary Wollstonecraft, and it was for fear Johnson might cut off her supplies that their marriage was at first kept a secret. For Godwin was hard up, and hard up he continued almost to the last. Why, is somewhat a mystery, for his yearly expenditure in 1793–95 averaged only £120, and the man who could write that memoir of his dead wife, and publish the *Letters to Imlay*, should surely at least have died rich. Still, borrowing £50 from Wedgwood, and going on a driving tour; sending £20 to a young protegé, and touring two months in Ireland, but failing to repay Ritson £30; borrowing other £100 of Wedgwood, but disappointing Holcroft of £20—muddlement such as this speaks much for itself, if little for philosophy; and besides there was Godwin's family. It was a mixed one, if not very large. In 1801, after two unsuccessful courtships, he married the bustling widow, Mrs Clements or Clairmont, his next-door neighbour, who one day had accosted him from her balcony: 'Is it possible that I behold the immortal Godwin?' She had two children already, and a third was born of the marriage. So there were poor Fanny Imlay (1794–1816), who died by her own hand; Mary Wollstonecraft Godwin (1797–1851), who in 1816 married Shelley; Charles Clairmont; 'Claire' Clairmont (1797–1879), the mother by Byron of Allegra; and William Godwin (1803–32), to whose posthumous novel, *Transfusion*, a memoir was prelixed by his father.

The last half of Godwin's long life may be briefly dismissed. A bookselling business, undertaken by him as 'Edward Baldwin' in 1805, involved him for years in difficulties, and in 1833 he was glad to accept the sinecure post of yeoman-usher of the Exchequer. His tragedy, *Antonio* (1800), was hopelessly damned; nor were any of his later prose works equal in either merit or success to *Political Justice* and *Caleb Williams*. The best are *St Leon*

(1799), a 'story of the miraculous,' and an *Essay on Sepulchres* (1809). A Life of Chaucer (1803), an Answer to Malthus (1820), *Lives of the Necromancers* (1834), and the novels *Fleetwood* (1805), *Mandeville* (1817), and *Cloudesley* (1830) may be named. Godwin died in Palace Yard, 7th April 1836. 'Pecksniff, with a dash of Micawber,' will seem a harsh verdict on one for whom Mr Kegan Paul has little save praise in his valuable and exhaustive biography, *William Godwin: his Friends and Contemporaries* (2 vols. 1876). See, too, Hazlitt's *Spirit of the Age* (1825); Leslie Stephen's *English Thought in the 18th Century* (1876); and other works cited at SHELLEY.

Godwin-Austen, the second highest peak in the world, is situated in the Himalayan system, in the western range that is crossed in the east by the Karakoram Pass. Its height is 28,250 feet. Distinguished in the records of the great trigonometrical survey only by the sign K2, it was named in 1888 after Lieut.-colonel Godwin-Austen of the Trigonometrical Survey of India.

Godwit (*Limosa*), a genus of birds of the snipe family (Scolopacidæ), with very long bill, slightly curved upwards, and long slender legs, with a great part of the tibia bare. All the species frequent marshes and shallow waters, chiefly those of the sea-coast, where they seek their food like snipes by wading and by plunging the long bill into the water or mud. They sometimes also run after small crustaceans or other animals, and catch them on the sands from which the tide has retired. Two species, the Black-tailed Godwit (*L. belgica*) and the Bar-tailed Godwit (*L. lapponica*), are as birds

Bar-tailed Godwit (*Limosa lapponica*).

of passage not unfrequent visitors of the marshy parts of the east coast of England, where the first used to breed. Nowadays the bar-tailed species is much the commoner, being especially abundant on the coast of Northumberland. Both normally breed in more northern countries, and are seen in Britain chiefly in their migrations northward and southward. Both have a wide range in Europe, Asia, and Africa. The females are larger than the males, and the whole length of the female black-tailed godwit, which is rather the larger species, is about 17 inches, the bill alone being 4 inches long. They are much esteemed for the table, and are sent from Holland to the London market.

Goes, or TER GOES, a town of Holland, on the island of South Beveland, 16 miles NE. of Flushing by rail. It contains a fine Gothic church of the 15th century and a ruined castle. Pop. 6393.

Goethe, JOHANN WOLFGANG, was born in Frankfort-on-the-Main, August 28, 1749. His father was a Doctor of Laws and obtained the title of imperial councillor. He was a man of honourable life, vigorous character, steadfast, industrious, and methodical; he possessed considerable culture, and was a special lover of Italian literature and art. Goethe's mother (1731–1808), daughter of J. W. Textor, chief-magistrate of Frankfort, was only eighteen when her son was born; she was remarkable for her bright temper and good sense. One child besides Goethe lived to adult years—his sister Cornelia, the companion of his youth (married 1773 to J. G. Schlosser, died 1777). The family occupied a house in the Hirschgraben, the rebuilding of which was a notable event in Goethe's boyhood. There was much in the life of the old free imperial city to stimulate his curiosity and awaken his imagination. He was quick to learn, and had the advantage of careful instruction from his father and from tutors. In 1759 French troops, siding with Austria in the Seven Years' War, entered Frankfort, and Count Thorane, a French officer, a cultivated man and a lover of art, was quartered in Goethe's house. The French theatre opened in the city attracted the boy, and thus he became familiar with Racine and more recent dramatists. He even attempted to compose in the manner of some of these, while also he was receiving literary influences from the lyrical poets of Germany. Latin, Greek, Italian, English, even Hebrew, were studied, and he planned a kind of prose fiction maintained by several correspondents in various languages. He had his moods of religious feeling, which at an early age were somewhat disturbed by doubts of God's goodness suggested by the Lisbon earthquake. The primitive, pastoral scenes of the Old Testament had a peculiar charm for his imagination. But while an ardent student in so many directions, he enjoyed the amusements of a boy among boys, and sometimes indeed among ill-chosen companions. When about fifteen years old (1763–64) he underwent a boy's joys and sorrows of love; Gretchen was of humbler rank than his own, and was some years his senior. She treated him as a child, and, circumstances having brought to light Goethe's wanderings in doubtful company, the pair were parted. For a time Goethe gave himself up to bitter feelings.

In the autumn of 1765 he was admitted a student of the university of Leipzig. He cared not at all for his law lectures, and not much for Gellert's lectures on literature or Ernesti's on Cicero's *De Oratore;* the awakening of his critical powers for a time damped his ardour for composition, and he fell into a melancholy mood. Companionship roused him to activity. The serious Schlosser, afterwards his brother-in-law, widened his range of literary sympathies; Behrisch served him as a severe yet kindly critic; but it was from Oeser, director of the academy of arts, and the friend of Winckelmann, that he received the most important intellectual gains of this period. 'Oeser,' he wrote, 'taught me that the ideal of beauty is simplicity and repose.' Goethe took lessons in drawing, tried to etch, studied the paintings at Leipzig, and visited the Dresden gallery. He read with enthusiasm Lessing's *Laocoon* and his *Minna von Barnhelm*, heard concerts, and was frequent in his attendance at the theatre. Nor in Goethe's life could much time ever pass without the presence or the incursion of love. His Frankfort fancy for Charitas Meixner faded before the stronger attraction of Käthchen Schönkopf (the Aennchen of his autobiography), daughter of a wine-seller at whose house he dined, a bright, frank girl, three years his senior. He began for her (1767) the little pastoral drama in Alexandrine verse, *Die Laune des Verliebten* (known to us in a revised form), to atone for his jealous humours. At Leipzig in 1768 he began a second play, painful in subject, *Die Mitschuldigen*, afterwards finished in Frankfort. A group of songs set to music by Breitkopf belong also to the Leipzig

period. Kathchen was wooed and two years later was won by the advocate Kanne. The friendship which Goethe had for Oeser's delightful daughter Friederike should not be classed among his loves.

On September 3, 1768, Goethe was again in Frankfort, seriously ill; it was feared that his lungs were affected. For the greater part of the following year he remained an invalid, and during this illness he sought religious consolation under the direction of his mother's friend, Fräulein von Klettenberg, one of the Moravian Brethren. Under her guidance and that of his doctor he made a study of alchemy, a subject not forgotten when he afterwards wrote *Faust*. Gradually health returned, and it was decided that he should complete his studies at the university of Strasburg. In April 1770 he arrived at the old city and saw for the first time its cathedral, which by-and-by made him a deeply-interested student of Gothic architecture. At the table where he dined he found lovers of literature in Lerse and the actuary Salzmann, and a man of a singular religious spirit in Jung Stilling. Goethe's pietistic fervour declined as he earnestly devoted himself to chemistry, anatomy, literature, antiquities, and, as far as was necessary, to his proper study, law. He had the good fortune to come under the influence of Herder, already known as an author, and through Herder he came to feel the attraction of old ballad poetry, of Ossian, and in a new and higher degree the power of Homer and of Shakespeare. Herder was well acquainted with English writers of his own century, and Goldsmith's *Vicar* especially delighted Goethe. When (October 1770) he made the acquaintance of Pastor Brion's family at the village of Sessenheim, it seemed to him that the Primrose household stood before him. The pastor's beautiful daughter, Friederike, eighteen or nineteen years old, and as good as she was beautiful, filled his heart with a new love, which she modestly yet ardently returned. She was the inspiration of some of Goethe's loveliest lyrics. But he would not or could not fetter his freedom, and he parted from her not without some sense of self reproach. Having obtained his doctor's degree, he returned (August 1771) to his native city.

Admitted an advocate, Goethe had no heart in his profession. His creative genius was fully roused, and when he read Shakespeare he felt himself moved to something like rivalry. In Goetz von Berlichingen, the German champion of freedom in the 16th century, he found a dramatic hero. He completed his play of *Goetz*, in its earliest form, before the close of 1771, and named it a dramatised history rather than a drama. In the following year he was engaged in critical work for the *Frankfurter gelehrte Anzeigen*, edited by a friend recently made, J. H. Merck of Darmstadt, a man of fine taste, somewhat cynical, and yet capable of generous admiration for one whose genius he was prompt to recognise. To this period belong the strikingly-contrasted poems *Der Wanderer* and *Wanderers Sturmlied*, the former telling of the beauty of ruined classic art amid the ever-living freshness of nature, the latter an improvisation of tempest and the genius of man which can defy the fury of the elements.

To gain further knowledge of law procedure Goethe settled for the summer (May–September) of 1772 in the little town of Wetzlar, the seat of the imperial courts of justice. His thoughts were, however, more with Homer and Pindar than with matters of the law. The months are memorable chiefly for Goethe's love for Lotte Buff, daughter of a steward of lands belonging to the Teutonic Order of Knights. Her brightness, her ingenuous goodness, her kind and graceful rendering of household duties charmed Goethe; but she was the betrothed of Kestner, the Gotha Secretary of Legation, and Goethe, as it has been described, 'saved himself by flight.'

Before returning to Frankfort he visited the authoress, Frau von Laroche, near Coblentz, and was interested in her dark-eyed daughter Maximiliane, soon to be the wife of the Italian Brentano. When once more at home he occupied himself with an essay on architecture, biblical studies, and the design for a dramatic poem on Mohammed. Early in 1773 he set himself to recast the *Goetz*, and this great work was ready for the printer in March of that year. Its fame was secured by the fact that it expressed with the energy of genius much of the passionate striving after freedom of thought and action characteristic of his own time; its romantic revival of the past fell in with another tendency of the age. A fervour of creation now possessed Goethe. To 1773 belong works of the most varied description, his majestic *Prometheus*, an important group of satirical farces, the comedy of *Erwin und Elmire* (finished June 1774, founded on Goldsmith's *Edwin and Angelina*), and already he was engaged on *Faust* and on *Werther*. He had heard some time previously of the suicide of young Jerusalem, a Wetzlar acquaintance, and weaving the story of Jerusalem with that of his own love for Lotte Buff, and adding something derived from the character of the jealous Brentano, he produced his wonderful book *Die Leiden des jungen Werthers* (finished March 1774), which gives as in an essence all the spirit of the 18th-century sentimental movement—that movement of which the most eminent French exponent was Rousseau. The marriage of Goethe's sister and his first acquaintance with Lavater are facts which also belong to the year 1773. Through Lavater he became much interested in the study of physiognomy.

In the spring of 1774 Goethe was at work on *Werther*, and he hastily wrote his play of *Clavigo*, a tragedy of faithless love, which was successful both on the stage and in book-form. It is in part founded on the *Mémoires* of Beaumarchais. A few scenes of *Faust* were written, and Goethe dreamed of a somewhat kindred theme in the Wandering Jew; at the same time his farcical vein was not exhausted. Eminent men were added to his acquaintance; among these were Klopstock and the educational reformer Basedow. In company with Basedow and Lavater he voyaged down the Rhine; and at Pempelfort he visited Fritz Jacobi, who grew to be a friend of his heart. Among influences derived from books, the most powerful was that of Spinoza's writings. The *Ethics* sustained and calmed Goethe's spirit amid its various agitations and helped to give a unity to his life. The dramatic writings of 1775, excepting that *Egmont* was begun, are of secondary importance—a little play with songs named *Claudine von Villa Bella*, and the more celebrated *Stella* (suggested by Swift's love perplexities with his Stella and Vanessa). Fernando in Goethe's play by a happy arrangement contrives to keep on terms with his pair of wives; in the author's recast of the play of many years later the hero shoots himself and Stella takes poison. Some of Goethe's most exquisite lyrics belong to 1775, and are connected with his love for Lili Schönemann, orphan daughter of a wealthy Frankfort banker, which led to an engagement and almost to marriage. Lili was graceful, accomplished, somewhat coquettish, and Goethe was not always a contented lover. After a time it was felt on both sides that a marriage would not lead to happiness. In the summer Goethe visited Switzerland in company with the two Counts Stolberg. He would have passed into Italy but that his love for Lili drew him back. A new life, however, was in store for him; in the autumn the

young Duke of Weimar, Karl August, invited him to visit Weimar: he accepted the invitation, and on November 7, 1775, entered Weimar, not then aware that he had here found an abiding place for life.

A new period of activity begins with Goethe's entrance to Weimar. When the first days of boisterous entertainment had passed, and in the spring of 1776 Goethe was made a member of the privy-council (*Geheimer Legationsrath*), he set himself strenuously to serve the state. By degrees much public work fell into his hands, and he acquitted himself of every duty with masterly intelligence and a rare thoroughness. In 1782 he received a patent of nobility. He superintended mines, saw to public roads and buildings, regulated finance, conducted military and university affairs, elevated the theatrical performances, in every direction making the influence of his mind felt. Above all, he helped to form the immature character of the duke. Nor did he fail to gain true friends. The dowager-duchess from the first had confidence in him, and by degrees he won the esteem and affection of the young wife of Karl August. Wieland, now of mature years, declared that he was 'as full of Goethe as a dewdrop of the morning sun.' Through Goethe's influence Herder obtained a public position and a home at Weimar. But his dearest friend was Charlotte von Stein, wife of Oberstallmeister von Stein, the mother of seven children, and several years older than Goethe. During ten years she was his confidant, his directress, the object of his ardent and tender homage. And she knew how to hold his feelings in check, and to chasten them when he was over-violent in his passion. She kept alive the ideal in his imagination while he was occupied with the details of real affairs. Yet there was something of unhealthy strain in this love which could not hope for its highest accomplishment in marriage. During these years Goethe's mind turned away from vague aspirings and sentimental moods to the definite and the real. He became deeply interested in the natural sciences—in geology and mineralogy, botany, comparative anatomy. His discovery of the intermaxillary bone in man (1784), and his theory of later date that all the parts of a plant are variations of a type which is most clearly seen in the leaf, show how his observing powers were aided by his imagination, and place him among the scientific forerunners of those great thinkers who have set forth the doctrine of evolution. Many literary works were begun in this period, but not many were brought to completion. Some lyrics of larger design and more elaborate form than his earlier songs show the growth of his powers. But the poem *Die Geheimnisse*, which was meant to embody his thoughts on the religions of the world, is a fragment. Two acts of his drama of *Tasso* were written (1780–81), but in prose. His noble dramatic poem, *Iphigenia*, classical in subject, partly modern in feeling, was written in full (1779), but, like *Tasso*, as yet only in prose. The short play, *Die Geschwister*, as well as the *Iphigenia*, was partly inspired by his feeling for Frau von Stein. In 1777 he began his novel of *Wilhelm Meister*, designed to show how the vague strivings of youth may be ennobled by their transition into definite and useful activity, and from time to time he made progress with it. The constant pressure of public business at length fatigued his mind, for, except a visit to Switzerland in 1779, he had few seasons of refreshment. He had long desired to visit Italy. When ten years of toil were ended he resolved to gratify that deep desire, and on September 3, 1786, he started on his journey for the south.

Goethe's residence in Italy lasted from the autumn of 1786 to June 1788. It was a most fruitful period. Now the steadfast habits of mind acquired in the course of public business in Weimar were applied to the study of art. He lived in a blissful calm, which was in fact the highest energy, examining the monuments of ancient art and renaissance painting, enjoying the beauty of nature, and studying the life of the people. His friends were chiefly artists—Tischbein, who painted his portrait at Rome, the Swiss Meyer, Angelica Kauffmann. He strove hard to draw, but with only moderate success. In the spring of 1787 he visited Naples and Sicily; at Palermo he made a sudden advance in his theory of botanical metamorphosis. Once again in Rome, he renewed his study of plastic art, and was inexpressibly happy amid a world of beauty. The literary work of the period was chiefly that of revising or recasting earlier writings. *Egmont* was carried to completion (1787); the prose *Iphigenia* was recast in verse (1786); the scene of the Witches' Kitchen was added to *Faust;* he sketched the plan and wrote a fragment of a tragedy, *Nausikaa*. On June 18, 1788, Goethe re-entered Weimar greatly enriched by his travel.

He was now relieved from the most irksome of his public duties, but continued to take an interest in the Ilmenau mines and in university reform at Jena. His private life also underwent a great change which relieved his heart from a strain, though in an ill way. His ardent idealising friendship for Charlotte von Stein was broken, and he took to his home a beautiful girl of humble rank, Christiane Vulpius, whom from the first he regarded as his wife, though the marriage ceremony was not celebrated until October 1806. Christiane had good qualities, and was dear to Goethe, but his choice was in many respects unsuitable. In December 1789 his son August was born. Memories of Italy mingle with his love of Christiane in the *Roman Elegies*, poems sensuously classical in their feeling and classical in their form. In the summer of 1789 he put the last touches to the play of *Tasso*, which contrasts the passionate heart of the poet with the worldly wisdom of the statesman and man of affairs —two sides of Goethe's own nature. Next year in the seventh volume of his Works appeared a great portion of the first part of *Faust* as 'a Fragment.' This, the story of Faust's measureless strivings for truth and for joy, and the love-tragedy of Gretchen, belongs essentially to Goethe's earlier years of the *Sturm-und-Drang*. The first part of *Faust*, completed in 1806, did not appear until 1808. Science continued to interest Goethe profoundly. His remarkable essay on the *Metamorphosis of Plants* was given to the printer in 1790, and when at Venice in May he suddenly struck out his much-discussed theory of the vertebral structure of the skull. His studies in optics, by which he hoped to disprove Newton's theory of colours, were a great affair of his life from this time onwards, but here his conclusions, though ingeniously argued, were unsound. In 1791 Goethe was entrusted with the control of the court theatre at Weimar, and it was his aim and earnest effort to make the stage a means of true artistic culture. He was himself roused to dramatic composition, and several pieces of these years were concerned with the revolutionary movement in France. In his *Venetian Epigrams* he complains that the political commotion threw back the advance of quiet culture. The *Grosskophta* (1791) dramatises the affair of the Diamond Necklace, studies Cagliostro's arts of imposture, and represents the demoralisation of aristocratic society in France. *Die Aufgeregten*—a dramatic fragment—in some degree holds the balance between conflicting political parties. The *Bürgergeneral* (acted 1793) is a broad jest at the German apostles of the Revolution. In Goethe's

hexameter version of the old Low German beast-epic, *Reynard the Fox* (printed 1794), he satirises the lusts and greeds of men under the disguise of beasts, and glances at the special vices of the Revolution days. In 1792 Goethe accompanied the duke on the disastrous campaign against the French; he heard the cannonade of Valmy, and went under fire in order to study his own sensations. Next year he was present at the siege of Mainz, and watched the French garrison march out. He has recorded his experiences and observations in an admirable narrative.

It is possible that at this time Goethe might have grown discouraged and bitter were it not for the friendship formed with Schiller in 1794. This friendship and its fruits till the memorable years from that date to 1805, the year of Schiller's death. Together they worked in the *Horen*, a review designed to elevate the literary standard in Germany. Together in the *Xenien* (1796) they discharged their epigrams against their foes, the literary Philistines. Schiller's sympathy encouraged Goethe to set to work once more on *Wilhelm Meisters Lehrjahre*, but the later books (1796) of the novel are written on a diminished scale as compared with the earlier. It may be said more than any other work of Goethe to exhibit his criticism on life. The charming epic-idyl, *Hermann und Dorothea*, in which Goethe's feeling for what is best in German life and character is happily united with his artistic Hellenism, belongs to 1796–97. Then, as it were in noble rivalry with Schiller, he wrote several of his finest ballads. He had also found time to translate from the Italian the autobiography of Benvenuto Cellini. His third and last visit to Switzerland (August–November 1797) interrupted the flow of his creative activity, and the works undertaken after his return were of less happy conception. The literary and artistic periodical, *Die Propyläen* (1798), was ill supported, and did not live long. Next year he planned his epic, *Achilleïs*, but it did not advance beyond one canto. His productive power slackening, he occupied himself in part with translating and adapting Voltaire's *Mahomet* (1799) and *Tancrède* (1800), and at a somewhat later date he translated Diderot's dialogue, *Le Neveu de Rameau*, from a manuscript. His drama, *Die natürliche Tochter*, founded on a French memoir, was designed as one part of a trilogy which should embody his mature views and feelings, but in a wholly impersonal form, on the events in France. It contains much admirable writing, but has a certain abstract air and a superficial coldness which prevented it from becoming popular. In 1801 Goethe was seriously ill, and painful attacks recurred from time to time. The death of Schiller in 1805 occurred while he himself was ailing, and it affected him with profound sorrow.

National disaster followed hard upon this grievous loss. In October 1806 the battle of Jena was fought, and next day Napoleon entered Weimar. Two years later, at the Congress of Erfurt, Goethe and Napoleon met. 'Voilà un homme!' exclaimed Napoleon; and in his turn Goethe recognised in the emperor a 'demonic' power created to rule the world. He has been blamed for lack of patriotism; but in a thoughtful kind of patriotism he was not deficient; his age and habits of mind forbade patriotism of a passionate, demonstrative nature.

In 1808–9 was written the novel, *Die Wahlverwandtschaften* (Elective Affinities). It contrasts characters of self-control with characters of impulse, is disinterestedly just to both, insists on the duty of renunciation, and shows the tragic consequences of infidelity of heart in married life. Some traits of the character of the heroine Ottilie are taken from Minna Herzlieb, the adopted daughter of the Jena bookseller Frommann, a beautiful girl, who might have grown too dear to Goethe if he had not checked the feeling. A little later Goethe published his two volumes on light and colour, *Zur Farbenlehre*; and these were speedily followed by the first part of his autobiography, *Dichtung und Wahrheit* (1811), the continuation of which occupied him from time to time during several subsequent years. It is a work of the deepest interest to students of Goethe's life and character, but its details of fact are not always exact, and its record of past feelings must be controlled by Goethe's letters written at the dates of which he treats.

The translation by Von Hammer of the *Divan* of the Persian poet Hafiz interested Goethe, and was an imaginative refuge from the political troubles of 1813–14. He was moved to creation of poems in a kindred spirit, and wrote (chiefly in 1814–15) the lyrical pieces published in 1819 under the title *West-östlicher Divan*. Part of their inspiration came from a Saint-Martin's summer of friendship—that felt for Marianne von Willemer, the young wife of a Frankfort banker, and the Suleika of the *Divan*. The poems are full of the sunny wisdom of a bright old age, which can play without self-deception at some of the passions of youth. A grief, real and deep, came to Goethe in his sixty-seventh year in the death of his wife. The Goethe house would have been desolate, but that in the summer of 1817 his son August brought a bright and sweet-tempered wife to dwell there, Ottilie von Pogwisch, and in due time Goethe had three grandchildren in whose happy childhood the old man found much gladness.

In his elder years Goethe still continued active. In 1821 was published *Wilhelm Meisters Wanderjahre*, a continuation of the *Lehrjahre*, but including many short tales that hang loosely together. Here Goethe sets forth an ideal of education, and inculcates the duty of reverence, helpful human toil, and brotherhood. The book was recast, and in this second form was finished February 1829. From time to time during more than half his life he had worked at the second part of *Faust*; it occupied him much during the closing years. By August 1831 it was at length complete. The hero Faust, leaving behind his first unhappy passion, advances through all forms of culture—statecraft, science, art, war—to the final and simple wisdom of disinterested service rendered to his fellow-men. Such a spirit cannot fall into the power of Mephistopheles, the demon of negation. His soul is received into Paradise and is purified by love.

Goethe's interest in science and art was undiminished by age. He had grown into sympathy with medieval art partly through the influence of his young friend Sulpiz Boisserée; a universal eclecticism is, however, the characteristic of his mind in its latest development. He is best seen during these years in his *Conversations with Eckermann*. Sorrows came fast towards the end; his older friends, all but Knebel, disappeared one by one. In 1828 died the grand-duke; next year, the Duchess Luise. Goethe's grief was deep; but he was even more violently shaken by the loss of his son August, who died at Rome, October 1830. Tended by his loving daughter-in-law, honoured and reverenced by those around him, Goethe lived until the spring of 1832. On March 22 of that year, after a short illness, he died peacefully in his arm-chair. His body lies near that of Schiller in the ducal vault at Weimar.

Goethe was a man of noble bodily presence both in youth and age. His influence has affected every civilised people, and seems still on the increase. His teaching has been styled the creed of culture; it is rather the creed of self-development with a

view to usefulness—usefulness to be effected by activity within wise limits.

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Goetz von Berlichingen. See GOTZ.

Goffe, WILLIAM, regicide, was born about 1605, son of the rector of Stanmer, in Sussex, 'a very severe Puritan.' He became a major-general in the parliamentary army, sat in the House of Commons and in Cromwell's 'other house,' and was one of the judges who signed Charles's death-warrant. In 1660, with his father-in-law, General Edward Whalley, he fled to America; and they lay in hiding round about New Haven from 1661 to 1664, when they went to Hadley, Massachusetts. There they lived for many years in seclusion; and it is there that, according to the well-known tradition, when the townsmen were called from the meeting-house to repel an Indian attack, and were standing irresolute, Goffe put himself at their head and drove off the red-skins, and then disappeared as suddenly as he had come. The genuineness of the story, however, has been questioned. Goffe appears to have died at Hartford in 1679. His papers have been printed by the Massachusetts Historical Society.

Gog and **Magog,** names several times used in the Bible, and given to the famous figures of giants in the Guildhall, London. Magog is spoken of by the writer of Genesis as a son of Japhet; Ezekiel speaks of Gog, prince of Magog, as a terrible ruler in the far north, united with the Persians, Armenians, and Cimmerians against Israel; Gog and Magog in the Apocalypse appear as co-ordinate terms comprehending all future enemies of the kingdom of God. The name Magog was often applied generally to all the unknown races north of the Caucasus. The Guildhall giants are images of the last two survivors of a race of giants who inhabited Albion, descendants of wicked demons and the thirty-three infamous daughters of the Emperor Diocletian, who, after murdering all their husbands, sailed to Albion. These giants Brute and his Trojans finally overcame, leading the last two survivors prisoners to London, where they were kept as porters at the palace-gate. This is Caxton's account; another represents one of the giants as Gogmagog, and the other as a British giant who killed him, named Corineus. These giants have stood in London since the days of Henry V., and have witnessed all its history since. The old giants were burned in the great fire, and the new ones, which are 14 feet high, were constructed in 1708. The ancient effigies, which were made of wicker-work and pasteboard, were carried through the streets in the Lord Mayor's Shows, and copies of the present giants were in the show of 1837. Formerly other towns in England and abroad had their giants, as the Antigonus of Antwerp, 40 feet in height, and Gayant, the giant of Douay, 22 feet in height.

Gogo, a seaport of British India, situated in the peninsula of Kathiawar, and on the Gulf of Cambay, 193 miles NW. of Bombay. It has a safe anchorage during the south-west monsoon, with smooth water and a muddy bottom, and the townsmen are reckoned the best sailors in India. Formerly a great cotton mart, its staple trade has deserted it for Bhaunagar, 8 miles distant, and the place has sunk greatly in recent years. Pop. now only about 7000.

Gogol, NICOLAI VASILIEVITCH, a Russian writer of decided power as a satirical humorist and delineator of conventional Russian life, and next to Pushkin and Turgénief the most popular of Russian writers, was born at the village of Sorochintsi, in the government of Poltava, 31st March 1809 or 1810. Soon after quitting the gymnasium of Niezhin, he went (in 1829) to St Petersburg, hoping to gain a living by literature. At first one disappointment followed another; however, in 1831 he became all at once famous by the publication of *Evenings in a Farm near Dikanka,* a collection of stories and sketches illustrating the life, customs, beliefs, and superstitions of the people of Little Russia. Originality, the fresh breath of nature, weirdness, dreamy sadness, poetic feeling, sly humour, keen observation, realistic description—these are the most striking traits in the book. A second series followed in 1834; amongst these were *Taras Bulba* (Eng. trans. 1887), a prose epic having for its subject the heroic chief of the Zaporogian Cossacks, a work aglow with martial ardour and vivid richness of imagination. Two other tales in the same collection, *Old-World Proprietors* and *How the Two Ivans Quarrelled* (Eng. trans. in *St John's Eve,* 1887), are wrought of entirely different materials. They are realistic studies of Russian provincial life, in which accurate portraiture of the monotonous days, the narrowly circumscribed self-centred interests, the trivial details, the humdrum duties, the contemptible vanities, prejudices, and ideas of the landed gentry are set forth in the light of a satirical and bantering humour, not unmingled with genuine pathos, and in which the drawing of the characters is marked by inexorable fidelity to life and strict logical consequence. Precisely the same vein was worked, and in the same way, in various short stories illustrative of typical figures of St Petersburg life, amongst which the best are *Nevskii Prospect* (or *The Painter*) and *Akakiu Akakievitch's New Cloak* (Eng. trans. in *St John's Eve*).

In 1836 there came from Gogol's pen one of the best of Russian comedies, *The Revising Inspector* (Eng. trans. by Hart-Davies, 1891, and by Sykes, 1893), which exposes with severity, yet with good-humour, the corruption, dishonesty, hypocrisy, self-satisfied ignorance, and vanity of the provincial administrative officials. In the following year (1837) he wrote his masterpiece, *Dead Souls,* or better *Dead Serfs* (Eng. trans. 1887), a story reflecting in sombre hues the more sordid, degraded, and commonplace aspects of provincial life. Throughout this work a heavy sadness prevails, a sort of hopeless abandonment of hope, which, however, does not prevent the reader from enjoying the humour, the stern characterisation, the subtle armour-piercing satire, the melancholy pathos which are there in abundant fullness. The ideas for both this book and the comedy were suggested to Gogol by the great Russian writer Pushkin, who was a personal friend. After unsatisfactory trials of official life, and, twice, of public teaching, including university lectures on history at St Petersburg in 1834, Gogol left his native land in 1836 to live abroad, mostly in Rome, until 1846, when he again settled in Russia. He died at Moscow, 3d March 1852. Shortly before his death he burned the second

and concluding part of *Dead Souls*. From his boyhood he was a prey to religious pessimism—doubtless partly the consequence of his own habits. His works are frequently printed in Russia. A complete edition, with his correspondence, appeared at Moscow in 6 vols. (1856–57). See C. E. Turner's *Studies in Russian Literature* (1883).

Gogra, or GHAGRA, one of the largest affluents of the Ganges, joins that river from the north, at the town of Chapra, after a generally south-east course of 600 miles. It rises in the higher Himalayas, passes through Nepal, and after reaching the level land becomes the great waterway of the North-west Provinces and Oudh. Its principal tributary is the Rapti, also of commercial importance.

Gohelwar', or GOHILWAD, a tract of country in Bombay presidency, comprising several tributary states, and lying along the Gulf of Cambay, on the eastern coast of the peninsula of Kathiawar. Gohelwar is one of the ten old territorial divisions of Kathiawar, and has an area of over 4000 sq. m., with a pop. of 100,000, mostly Hindus.

Goil, LOCH, a small but highly picturesque loch in Argyllshire, Scotland, is a branch of Loch Long (q.v.), and is 6 miles in length and less than 1 mile in breadth. Its shores are for the most part wild and rugged; but the general character of the scenery is modified by extensive natural woods of hazel. The mountains in the neighbourhood rise to the height of more than 2000 feet. Lochgoilhead is a favourite summer watering-place. It may be visited by steamers from Greenock (20 miles), and has connection by coach with Inveraray.

Goitre (Fr.), or BRONCHOCELE, the name applied to any enlargement of the Thyroid Gland (q.v.) which is not either inflammatory or cancerous. The commonest and most interesting form of the disease is that which is *endemic* in certain districts, particularly in mountainous regions—e.g. among the Alps, the Himalayas (as at Darjeeling), and the Andes. In Britain it is most often met with in Derbyshire, and hence popularly called 'Derbyshire neck;' but even there it is not common. In some villages among the Alps all the inhabitants without exception are affected. Endemic goitre is often associated in the same districts and the same families with Cretinism (q.v.). Numerous theories have been advanced to account for it; it has been attributed to damp climate, snow-water, water with excess of lime or of magnesia, bad feeding, bad ventilation, and many other influences. But no one of these alleged causes is present in marked degree in all affected localities: it seems probable that various different combinations of causes are capable of producing a similar effect on the thyroid.

Sporadic cases of goitre, indistinguishable as regards the swelling from the endemic form, except that they do not attain such a large size, occur in all parts of the world. In either case, the enlargement may affect all the tissues of the gland equally, or may have its chief seat in the blood-vessels or the fibrous tissue, or may be much exaggerated by the formation of Cysts (q.v.) in the gland. In that form called *Exophthalmic* goitre, or Graves's disease, after its first describer, the thyroid enlargement is vascular and pulsating, and is associated with protrusion of the eyes, rapid action of the heart, &c., and is clearly only one symptom of a wide disturbance of the nervous system.

In other forms of goitre the tumour produces as a rule no obvious ill effects, except the inconvenience arising from its size, for it may be so large as to hang down upon the breast, or even to admit of being thrown over the shoulder. In some few cases, however, where it does not project so much forward, it is apt to press upon the windpipe, embarrassing the respiration, and may even cause death in this way.

Endemic goitre may usually be cured or checked by removal at an early stage of the malady to an unaffected district and more healthy surroundings. Where this is not practicable, and in sporadic cases, iodine is the favourite remedy, both applied locally and administered internally; but no method is uniformly or certainly successful in the reduction of the enlargement. In bad cases the gland has frequently been removed; but the evil results which are now known often to follow (see MYXŒDEMA) have made surgeons, during late years, most unwilling to undertake the operation, itself a serious one. Partial removal is not open to the same objection; nor is division of the tumour in the middle line without removal. Both these proceedings sometimes give great relief, and may be followed by shrinking of the remaining gland substance. See W. Robinson, *Endemic Goitre or Thyrocele* (1888).

Golchika, a small port at the mouth of the Yenisei (q.v.).

Golconda, an extensive fortress of the Nizam, situated on a granite ridge, 7 miles W. of Hyderabad. In its immediate neighbourhood are the ruins of an ancient city, once the metropolis of the powerful kingdom of Golconda, which reached its height at the close of the 16th century, and endured till 1687. The place itself is still strong; but it is commanded within breaching-range by the yet solid mausoleums of its former sovereigns, about 600 yards distant. The fort is held by a small garrison from Hyderabad, and serves as the Nizam's treasury, and also as a state prison. Golconda is proverbially famous for its diamonds; but, in truth, they were merely cut and polished here. See DIAMOND.

Gold (symbol Au, atomic weight 196) is perhaps the most widely and universally sought product of the earth's crust. In the very earliest writings which have come down to us gold is mentioned as an object of men's search, and as a commodity of extreme value for purposes of adornment and as a medium of exchange. The importance which it possessed in ancient times has certainly not lessened in our day. Without the enormous supplies of gold produced at about the time when the steam-engine was being brought into practical use it is difficult to imagine how our commerce could have attained its present proportions; and but for the rush of immigrants to the gold-fields in the beginning of the second half of this century Australia might have remained a mere convict settlement, and California have become but a granary and vineyard.

On the score of geographical distribution, gold must be deemed a common metal, as common as copper, lead, or silver, and far more common than nickel, cobalt, platinum, and many others. Theorists have propounded curious rules for the occurrence of gold on certain lines and belts, which have no existence but in their own fancy. Scarcely a country but has rewarded a systematic search for gold, though some are more richly endowed than others, and discoveries are not always made with the same facility. The old prejudices, which made men associate gold only with certain localities, hindered the development of a most promising industry even within the British shores. Despite the abundant traces of ancient Roman and other workings, the gold-mines of Wales were long regarded as mythical; but recent extended exploitation has proved them to be among the richest known. This is notably the case in the Dolgelly

district, where considerable gold occurs, both in alluvial gravels and in well-formed quartz veins traversing the Lower Silurian Lingula beds and the intruded diabasic rocks called 'greenstone' in the Geological Survey. A peculiarity of the veins is the common association of magnesian minerals. The gold is about 20 or 21 carat fine, and often shows traces of iron sesquioxide. So long ago as 1861 some £10,000 worth of gold per annum was taken out of the Clogan mine by imperfect methods. Some samples have afforded 40 to 60 ounces per ton—a most remarkable yield. There are probably many veins still awaiting discovery.

To quote another European example, Hungary afforded the Roman conqueror fabulous riches, and will yet produce untold wealth, when the capitalist shall condescend to look so near home. Statistics concerning the annual gold output of the world are for many reasons only approximately correct. In countries where a royalty is payable on the gold mined 'returns' are sure to be much below the actual yield; while in uncivilised lands no record is kept. Therefore it is not easy to arrive at a computation of the yearly production. But it is certain that the tendency in 1881-90 was toward a decline rather than the contrary. This is due to the fact that the enormous placer deposits of many regions had to a great degree been worked out; and, though vein-mining was extended as the placers failed, the extraction of gold from the vein-stuff was a slower and more costly operation, requiring a larger expenditure of capital and employing more labour. Thus, the great yields obtained between 1850 and 1870, reaching 30 to 40 million pounds sterling annually, were the result of extensive placer operations that gradually ceased. In 1881-90 the average production was £21,738,000. But the development of gold-mining was such that in 1896 the production was more than double, approximately £45,000,000, distributed thus: United States, £10,800,000; Australasia, £8,988,000; Transvaal, £8,604,000; India, £5,911,000; Russia and other countries (including British Guiana, British Columbia, &c.), £10,697,000. This did not include any gold from the enormously rich field of Klondyke, &c., in the upper Yukon valley, which began to attract notice only in that year. Other recent developments were those in the Transvaal (q.v.) and Western Australia (q.v.). From 1850 till 1896 the total gold production was estimated at 300,000,000 ounces, with a value of £1,163,000,000. For the appreciation of gold and the economic questions thence arising, see BIMETALLISM. See also GILDING, GOLD-BEATING.

Geologically, as well as geographically, gold is widely dispersed. The early geologists propounded theories concerning the age of gold deposits which did as much to retard the development of gold-mining as to promote it; for while they indicated certain formations as being probably auriferous, and drew attention to them, they, on very slight grounds, pronounced other formations to be positively non-auriferous, and thus dissuaded prospectors from studying beds which almost accidentally have been found to be rich in gold over enormous areas and to great depths. In the light of modern explorations it would be unsafe to say that any formation must *a priori* be barren of gold. On the contrary, its presence may be always anticipated, if not in workably paying quantity, until its absence has been proved.

The origin of gold-bearing mineral veins is inseparably connected with that vexed question, the origin of mineral veins generally (see ORE-DEPOSITS). Suffice it to say here in brief that, while one class of geologists ascribe it exclusively to igneous agencies, another class as stoutly defend a theory of aqueous solution. It is not unreasonable to suppose that the truth lies between the two parties—that some deposits are due to plutonic and others to aqueous origin. Gold has been found and worked in rocks of undoubted igneous origin and of primary age. It has also been found in the interstices of a lava ejected within historic times. On the other hand, its presence has been proved in the water of the seas surrounding the British Islands, and in the deposit formed by hot springs now in activity. Speaking broadly, a gold deposit may be of any geological age, from that of the oldest rocks to that of rocks still in course of formation. But hitherto its presence in notable quantity has been chiefly proved in connection with certain formations. Taking the sedimentary rocks in chronological order, the chief auriferous regions may be classified as follows: Metamorphic rocks afford the chief gold-supplies of Nevada, South Dakota, Siberia, Hayti, India, Japan, and New Caledonia. Laurentian rocks are auriferous in West Africa, Brazil, and Canada; Cambrian in Nova Scotia and Brazil. Silurian is the great gold formation of Australia, and figures in New Zealand, French Guiana, and the Andes. Devonian age is ascribed to some of the gold of Cornwall, Siberia, and Australia. The coal-measures of Queensland, partly of Carboniferous and partly of Permian age, enclose the Gympie goldfield; and some of the gold beds of New Zealand, New Brunswick, Nova Scotia, New Mexico, Ladakh, India, New South Wales, and Somersetshire are of Carboniferous age. The Jurassic formation has not proved of much importance, but affords some gold in Europe and Mexico. Triassic rocks are abundantly gold-yielding in California and Mexico. Chalk is probably as little associated with gold in men's minds as is coal, yet the Cretaceous rocks of California, South Dakota, New Zealand, Queensland, Afghanistan, and Hungary afford large supplies of the precious metal. The Tertiary gravels of the western states of America and of Australasia have been the source of the enormous yields of placer gold from those countries, and embrace thousands of square miles of Miocene, Pliocene, and Post-pliocene beds resulting from the erosion and disintegration of the gold-carrying veins of the older rocks.

Of the igneous rocks with which gold is associated, diorites hold a foremost place in Hungary, Nevada, New South Wales, Victoria, Queensland, South America, Italy, the Urals, India, Turkestan, New Guinea, and New Zealand. Granite, syenite, and gneiss are auriferous in Colorado, Virginia, Carolina, South America, Canada, Australia, Turkestan, Asia Minor, Hungary, and Siberia. Porphyritic rocks carry some of the gold of Queensland, Victoria, New Zealand, Borneo, and South America. The serpentines of Queensland and Newfoundland have yielded gold; while the trachytes of New Zealand, South Dakota, Mexico, Queensland, and Hungary are important gold-carriers.

By far the most common matrix of vein-gold is quartz or silica, but it is not the only one. To pass by the metals and metallic ores with which gold is found (because it will be more convenient to deal with them when speaking of the treatment necessary to release the gold), there are several other minerals which serve as an envelope for the precious metal. Chief among them is lime. Some of the best mines of New South Wales are in calcareous veins. Sundry gold reefs in Queensland, New South Wales, Victoria, and Bohemia are full of calcite. Dolomite occurs in Californian and Manitoban mines; and apatite, aragonite, gypsum, selenite, and crystalline limestone have all proved auriferous, while in some cases neighbouring quartz

has been barren. Felspar in Colorado and felsite magnesian slate in Newfoundland carry gold.

The physical conditions under which gold occurs are extremely variable. Popularly speaking, the most familiar form is the 'nugget,' or shapeless mass of appreciable size. These, however, constitute in the aggregate but a small proportion of the gold yielded by any field, and were much more common in the early days of placer-mining in California and Australia than they are now. The largest ever found, the Welcome Nugget, discovered in 1858 at Bakery Hill, Ballarat, weighed 2217 oz. 16 dwt., and sold for £10,500, whilst not a few have exceeded 1000 ounces. The origin of these large nuggets has been a subject for discussion. Like all placer or alluvial gold, they have been in part at least derived from the auriferous veins traversing the rocks whose disintegration furnished the material forming the gravel beds in which the nuggets are found. But no mass of gold has ever been discovered in a vein equal in size to many of the nuggets unearthed from the gravels. Hence has arisen a theory that in the course of ages nuggets have 'grown' in the gravels—that is to say, nodular fragments of gold have gradually accumulated and attached to themselves smaller fragments with which they came in contact, and perhaps helped to cause the re-deposition of gold held in suspension or solution by mineral waters which have percolated through the superincumbent mass of gravel. Gold nuggets have been artificially formed in the laboratory by decomposing solutions of the chloride or sulphide. In the earliest experiments organic matter was added to effect the decomposition—e.g. a piece of wood; but it has been found that the presence of organic matter is by no means necessary, and that fragments of pyrites and other mineral bodies common in auriferous formations are very suitable nuclei on which the gold accumulates in a concretionary state, resembling natural nuggets.

The more common form of alluvial gold is as grains, or scales, or dust, varying in size from that of ordinary gunpowder to a minuteness that is invisible to the naked eye. Sometimes indeed the particles are so small that they are known as 'paint' gold, forming a scarcely perceptible coating on fragments of rock. When the gold is very fine or in very thin scales much of it is lost in the ordinary processes for treating gravels, by reason of the fact that it will actually float on water for a considerable distance.

Vein-gold is often crystalline in structure, the elementary form being cubical. In some localities too, notably in Hungary, it assumes most beautiful leaf-like forms, such fetching a high price among collectors for mineral cabinets. In the ores of other metals, such as pyrites, galena, &c., gold very commonly occurs as an accessory, but cannot be detected except by assay. Whether, as in all other cases, the gold exists in the native state in such ores is open to some doubt. It is never found absolutely pure; some silver is always present as an alloy, and occasionally also bismuth, lead, and tellurium.

From what has been already said it will be evident that gold-mining must be an industry presenting several distinct phases. These may be classed as alluvial mining, vein-mining, and the treatment of auriferous ores.

In alluvial mining natural agencies, such as frost, rain, &c., have, in the course of centuries, performed the arduous tasks of breaking up the matrix which held the gold, and washing away much of the valueless material, leaving the gold concentrated into a limited area by virtue of its great specific gravity. Hence it is never safe to assume that the portion of the veins remaining as such will yield anything like so great an equivalent of gold as the alluvials formed from the portion which has been disintegrated. As water has been the chief (but not the only) agent in distributing the gold and gravel constituting alluvial diggings or placers, the banks and beds of running streams in the neighbourhood of auriferous veins are likely spots for the prospector, who finds in the flowing water of the stream the means of separating the heavy grains of gold from the much lighter particles of rock, sand, and mud. Often the brook is made to yield the gold it transports by the simple expedient of placing in it obstacles which will arrest the gold without obstructing the lighter matters. Jason's golden fleece was probably a sheepskin which had been pegged down in the current of the Phasis till a quantity of gold grains had become entangled among the wool. To this day the same practice is followed with ox-hides in Brazil, and with sheepskins in Ladakh, Savoy, and Hungary. This may be deemed the simplest form of 'alluvial mining.' If the gold deposited in holes and behind bars in the bed of the stream is to be recovered, greater preparations are needed. Either the river-bed must be dredged by floating dredgers, worked by the stream or otherwise; or the gravel must be dug out for washing while the bed is left dry in hot weather; or the river must be diverted into another channel (natural or artificial) whilst its bed is being stripped. The first-named method is best adapted to large volumes of water, but probably is least productive of gold, passing over much that is buried in crevices in the solid bed-rock. The second plan is applicable only to small streams, and entails much labour. The third is most efficient, but very liable to serious interference by floods, which entail a heavy loss of plant.

In searching for placers it is necessary to bear in mind that the watercourses of the country have not always flowed in the channels they now occupy. During the long periods of geological time many and vast changes have taken place in the contour of the earth's surface. Hence it is not an uncommon circumstance to find beds of auriferous gravel occupying the summits of hills, which must, at the time the deposit was made, have represented the course of a stream. In the same way the remains of riverine accumulations are found forming 'terraces' or 'benches' on the flanks of hills. Lacustrine beds may similarly occur at altitudes far above the reach of any existing stream, having been the work of rivers long since passed away.

So far, account has been taken only of gravels lying practically within view. But in many instances an enormously thick covering of more recently distributed material, resulting from the denudation of non-auriferous rocks, hides the earlier gravel, which is auriferous. Such a phenomenon was not suspected until the first instance of the kind was discovered by some miners who, in following a gravel patch formed by an existing watercourse, were led to burrow into the side of the adjacent hill, under which the golden ground continued to be found, and then men realised that the modern stream was only redistributing the rich accumulation made by a river belonging to a system that had ceased to exist. As prospecting extended and became a subject for scientific study, such instances rapidly multiplied, and to these 'deep leads' or 'dead rivers' is due the bulk of the placer gold found in Australasia and California. Generally the watersheds in the extinct system run at right angles to the present, so that operations often extend under modern hill-ranges. A more surprising discovery was that many of the ancient river-beds had been filled up by flows of volcanic rock, and in not a few cases several streams of molten matter had at varying intervals displaced

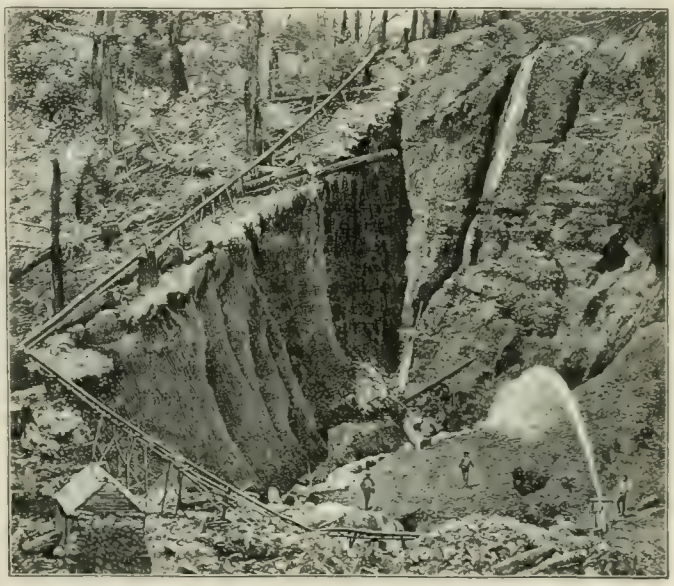
the river, which afterwards resumed its course and its habits, so that the extraordinary feature is encountered of several superposed beds of auriferous gravel alternating with layers of lava.

Another form of alluvial digging occurs in Western America and New Zealand, where the sea washes up auriferous sands. These are known as 'ocean placers' or 'beach diggings,' and are of minor importance.

Whilst most placers have been formed by flowing water, some owe their origin to the action of ice, and are really glacial moraines. Others are attributed to the effects of repeated frost and thaw in decomposing the rocks and causing rearrangement of the component parts. Yet another class of deposits is supposed to have been accumulated by an outpouring of volcanic mud. And, finally, experts declare that some of the rich *banket* beds of the Transvaal became auriferous by the infiltration of water containing a minute proportion of gold in solution.

In all cases the recovery of alluvial gold is in principle remarkably simple. It depends on the fact that the gold is about seven times as heavy, bulk for bulk, as the material forming the mass of the deposit. The medium for effecting the separation is water in motion. The apparatus in which it is applied may be a 'pan,' a 'cradle,' or a 'tom,' for operations on a very small scale, or a 'sluice,' which may be a paved ditch or a wooden 'flume' of great length, for large operations. The *modus operandi* is the same in all: flowing water removes the earthy matters, while obstructions of various kinds arrest the metal. As a rule it is more advantageous to conduct the water to the material than to carry the material to water. In many cases a stream of water, conveyed by means of pipes, and acting under the influence of considerable pressure, is utilised for removing as well as washing the deposit. This method is known as 'piping' or 'hydraulicing' in America, where it has been chiefly developed, but is now forbidden in many localities, because the enormous masses of earth washed through the sluices have silted up rivers and harbours, and caused immense loss to the agricultural interest by burying the rich riverside lands under a deposit that will be sterile for many years to come. The plan permits of very economical working in large quantities, but is extremely wasteful of gold. The water-supply is of paramount importance, and has led to the construction of reservoirs and conduits, at very heavy cost, which in many places will have a permanent value long after gold-sluicing has ceased. These large water-supply works are often in the hands of distinct parties from the miners, the latter purchasing the water they use. To give an example of the results attained in alluvial mining, it may be mentioned that in a three-months' working in one Victorian district in 1888 over 33,500 tons of wash-dirt were treated for an average yield of 18½ grains of gold per ton, or say, one part in 700,000. Where water cannot be obtained recourse is had to a fanning or winnowing process for separating the gold from the sand, which, however, is less efficacious.

Vein-mining for gold differs but little from working any other kind of metalliferous lode. When the vein-stuff has been raised it is reduced to a pulverulent condition, to liberate the gold from the gangue. In some cases roasting is first resorted to. This causes friability, and facilitates the subsequent comminution. When the gold is in a very fine state, too, it helps it to agglomerate. But if any pyrites is present the effect is most detrimental, the gold becoming coated with a film of sulphur or a glazing of iron oxide. The powdering of the vein-stuff is usually performed in stamp batteries, which consist of a number of falling hammers. While simple in principle, the apparatus is complicated in its working parts, and is probably destined to give way to the improved forms of crushing-rolls and centrifugal roller mills, which are less costly, simpler, more efficient, and do not flatten the gold particles so much. One of the most effective is that by Jordan. When the vein-stuff has been reduced to powder, it is akin to alluvial wash-dirt, and demands the same or similar contrivances for arresting the liberated gold and releasing the tailings—i.e. mercury troughs, amalgamated plates, blanket strakes, &c.; but, in addition, provision is made for catching the other metalliferous constituents, such as pyrites, which almost always carry a valuable percentage of gold. These pyrites or 'sulphurets' are cleansed by concentration in various kinds of apparatus, all depending on the greater specific gravity of the portion sought to be saved.



Hydraulic Mining, Devil's Creek, Reefton, New Zealand.

Of the metals and minerals with which gold is found intimately associated in nature are the following: antimony, arsenic, bismuth, cobalt, copper, iridium, iron, lead, manganese, nickel, osmium, palladium, platinum, selenium, silver, tellurium, tungsten, vanadium, and zinc, often as an alloy in the case of palladium, platinum, selenium, silver (always), and tellurium. The methods of separation vary with the nature of the ore and the conditions of the locality. In the case of sulphides of some of the base metals the sulphur can be oxidised by burning in suitable kilns, so as to afford sulphurous or sulphuric acid, leaving the gold and other metals in the 'cinders,' whence they can be recovered by solution. Where the base metal is volatile it may be obtained by condensing the fumes. To get rid of the sulphur and arsenic in the ore (with or without

utilising them) is generally the first step, and is most commonly performed in some kind of furnace. This done, the 'sweet' cinders are subjected to the action of chlorine, which forms a soluble chloride with the gold, easily separable by washing with water. There are many ways of effecting this, some being the subjects of patent rights, for which very large sums have been injudiciously paid by the British public. Sometimes the washing and chlorination are combined in one operation by placing salt in the furnace; but in many cases this has led to enormous loss of gold by volatilisation. This question is too complicated for discussion here, but may be studied in Lock's *Practical Gold Mining* (1889), which contains also a complete bibliography of the subject.

The most important physical and chemical properties of gold are as follow: In malleability it stands first of the metals, and its ductility is remarkable, hence it may be beaten into leaves not exceeding $\frac{1}{282000}$ of an inch thick, and quite translucent, and 1 grain in weight may be made to cover 56 square inches of surface, or drawn into a wire 500 feet long. Its specific gravity is about 19·2 when fused, or 19·4 when hammered, being less than platinum and iridium. Its colour and lustre in the concrete form are sufficiently familiar, but when thrown down from solution in a minute state of division it appears brown, and seen by transmitted light while held in suspension the atoms exhibit a purple tint, as also when it is volatilised. In softness it approaches lead, and in tenacity it ranks below iron, platinum, copper, and silver; yet a wire only $\frac{1}{8\,8\,8\,0}$ of an inch thick will support 150 lb. It is an excellent conductor of heat and electricity. Its fusing-point is 2016° by Daniell's pyrometer. When pure it is difficult of volatilisation, requiring the intense heat of an oxy-hydrogen flame, or a strong electric current. It was long thought to be practically non-volatile in the heat of an ordinary furnace; but, as has been already stated, under certain conditions it is very readily vaporised, and immense losses have been incurred in consequence.

Having but little affinity for oxygen, gold is not affected by exposure to the air; but two oxides may be formed artificially—the protoxide, AuO, by decomposing gold protochloride with a potassic solution, and a teroxide, AuO_3, or auric acid by boiling terchloride with magnesia or carbonate of soda. Silica, on the other hand, attacks it with avidity, forming a silicate which is extremely insoluble in water, but decomposes with age. Sulphuretted hydrogen combines with gold at ordinary temperatures to form a sulphide, which is soluble in alkaline sulphides, and slightly so in pure water. A bisulphide is obtained by passing sulphuretted hydrogen through a cold solution of terchloride; and a double sulphide of gold and potash is produced by heating gold in a very fine state with sulphur and carbonate of potash, constituting the porcelain gilding known as 'Burgos lustre.' Gold is affected by selenic acid, and is dissolved by iodine and by hyposulphite of soda. It is not affected by alkalies, nor by hydrochloric, nitric, or sulphuric acid alone; but is rapidly dissolved by aqua regia (nitro-hydrochloric acid), and by any substance liberating chlorine. Two chlorides are known: a proto salt, AuCl, and a ter salt, $AuCl_3$, the latter forming reddish-yellow solutions with water, ether, and alcohol. Gold is volatile in the presence of chlorine at all temperatures between boiling water and white heat, and cannot be recovered by condensation, but only by decomposition of the volatile chloride. Gold chloride and sulphide remain in solution in presence of excess of sulphuretted hydrogen and an alkaline carbonate, the gold gradually depositing as the carbonic acid escapes. Gold solutions are precipitated by oxalic, tartaric, citric, and other organic acids; also by wood, bark, charcoal, and other organic matters, the gold being thrown down in a pulverulent form, and recoverable by burning. Gold is also precipitated by iron sulphate, and by sulphur dioxide in the presence of water, as a metallic powder; further, by copper sulphide, which, when converted into sulphate, yields the gold in a metallic state highly favourable for collecting. Mineral sulphides (e.g. pyrites) decompose gold solutions, and collect the gold in a coherent form; they similarly attack gold chloride volatilised in the roasting furnace, and absorb it.

Gold forms many alloys with other metals. Those occurring in nature have been already mentioned; their importance is very small industrially. But another alloy, that with copper, is of prominent value, being the basis of gold coinages. The admixture of copper lessens the density, but increases the hardness and fusibility of the alloy, rendering it better suited to the purpose. The proportion of copper in standard gold coin varies, being 8·33 per cent. in Great Britain, and 10 per cent. in France and the United States. In Great Britain, since 1816, gold is the only legal tender for sums above forty shillings; in many other countries gold coin is latterly coming into extended use where formerly silver only was employed. The market price of gold bullion varies with its purity: pure gold (24 carat) is worth £4, 4s. 11½d. per oz., while 22 carat fetches only £3, 17s. 10½d., and 20 carat £3, 10s. 9½d. (see BIMETALLISM, CURRENCY, MONEY). The readiness with which gold alloys with mercury is very largely utilised in collecting the scattered fragments of the precious metal, in treating auriferous sands and rocks, and, on a smaller scale, in gilding. The conditions governing perfect amalgamation of crude gold demand most minute attention from the miner. The fanciful alloys of gold made by jewellers are chiefly:

Red gold	75	parts	fine	gold	+	25	parts copper
Dead leaf gold	70	"	"	"	+	30	" silver.
Green gold	75	"	"	"	+	25	" "
Water green gold	60	"	"	"	+	40	" "
Blue gold	75	"	"	"	+	25	" iron.

See ALLOYS, AMALGAM; also ASSAY, METALLURGY, MINING. Gold may and often does cost more to produce than it is worth. In Victoria, where it is economically worked, the total average of gold produced per head of all engaged in gold-mining was in 1887 only £96, 17s. 2d.; so that the gold miner's wage may safely be set down as lower than those given in the colony for many other kinds of work. Among notable gold discoveries are those in California in 1848; Australia (New South Wales and Victoria) in 1851; British Columbia, 1858; New Zealand and Nova Scotia in 1861; South Africa (Transvaal) and Sutherlandshire, 1868; Western Australia, 1870; South Australia, 1886; Klondyke, 1896. The enormous output of the Transvaal (q.v.) and Western Australia (q.v.) led, in 1895–96, to wild speculation.

Fulminating gold is an extremely explosive green powder made from teroxide of gold and caustic ammonia.—*Purple of Cassius* is a compound of gold and tin used in colouring Glass (q.v.).—*Mosaic gold* is sulphide of Tin (q.v.).

See, besides the writer's work above mentioned, T. K. Rose, *The Metallurgy of Gold* (1894); H. Louis, *Handbook of Gold Mining* (1894); and works by T. S. G. Kirkpatrick (1890), and Macdermott and Duffield (1890).

Gold, FIELD OF THE CLOTH OF, the meeting in 1520 between Henry VIII. (q.v.) and Francis I.

Goldau, a small Swiss town behind the Rigi and on the St Gotthard railway, was utterly destroyed by a landslip, 2d September 1806; while the

neighbouring villages of Businger, Röthen, and Lowerz were overwhelmed, and a part of the Lake of Lowerz was filled up, by the fall of the upper slope of Mount Rossberg. The valley is now a wild rocky waste, overgrown with grass and moss. The village of Neu-Goldau, on the line of the Rigi railway, consists of but a few houses.

Gold-beater's Skin, a very thin but tough membrane prepared from the external coat of the cæcum a part of the great intestine—of the ox. It is drawn off in lengths of 25 inches or more from the other coats, immersed in a weak solution of potash, and scraped with a blunt knife upon a board. After a soaking in water, two of these pieces are stretched upon a frame, dried, and then separated by a knife. Each strip is again fixed with glue to a frame, and washed over with a solution of alum. When dry it is next coated with fish-glue, and afterwards with white of egg. The piece of membrane is then cut into squares of 5 or 5½ inches. A gold-beater's *mould* contains from 900 to 950 of these squares, and to furnish this nearly 400 oxen are required. Besides its application in gold-beating, this fine membrane is used in the dressing of slight wounds.

Gold-beating is a very ancient art, having been practised from a remote period among oriental nations. Gilding with leaf-gold is found on the coffins of Egyptian mummies, on some Greek pottery vases of as early a date as the 4th or 5th century B.C., and on portions of the palaces of ancient Rome. Beckmann states that the German monk Theophilus, who appears to have lived at least as early as the 12th century, describes the process nearly as it is at present, the gold having been beaten between parchment, which is practically the same as the modern method. Formerly the gold-beater's art was largely practised in Florence, but in that city the production of fine gold-leaf has greatly diminished during the latter half of the 19th century through French and German competition, the latter country especially now making large quantities of an inferior gold-leaf. Gold-beating is practised in most of the large towns of the United Kingdom, but London is its chief centre.

According to the shade of colour required gold is alloyed for beating either with silver or copper or with both. The proportion of copper rarely exceeds one-twentieth part that of the gold, but the quantity of silver in the alloy is sometimes much larger. The ingot being prepared, it is rolled out into a ribbon 1½ inches wide, a 10-feet length of which weighs an ounce. This length of ribbon is then annealed and cut into about 75 pieces of equal weight. Formerly these were placed between leaves of vellum, but a tough kind of paper is now used with a leaf of vellum at intervals through the packet, which is from 3½ to 4 inches square. The pile of bits of gold ribbon thus interleaved is called a 'cutch,' and this, having been placed upon a thick block of marble about 9 inches square, resting on a strong bench, is beaten with a hammer weighing from 15 to 17 lb., till the pieces of gold extend to the size of the squares of the paper. The hammer rebounds by the elasticity of the vellum, which saves or at least lessens the labour of lifting it. Each square of gold in the cutch is now taken out, cut into four pieces, and placed between leaves of Gold-beater's Skin (q.v.). This packet, termed a 'shoder,' is beaten with a 9-lb. hammer for about two hours, or six times as long as in the first or cutch beating. For the final beating the gold leaves from the shoder are again divided into four, and each piece placed between leaves of fine gold-beater's skin, about 950 of which form a packet termed a 'mould.' After four hours' beating with a 7-lb. hammer the gold-leaf in the mould is of the thickness usually sold, which averages the 282,000th part of an inch. Each skin of the mould is rubbed over with calcined gypsum to prevent the gold adhering to it. One grain of gold in the form of gold-leaf of the ordinary thickness used in gilding measures about 56 square inches, but it can be beaten out to the extent of 75 square inches. A grain of silver can be beaten out to a still greater extent, but the leaf would really be thicker, since this metal has not nearly the density of gold.

An alloy consisting of 37 grains of gold, 2 of silver, and 1 of copper makes a leaf with a deep yellow colour. A compound containing 4 grains of gold to 1 of silver gives a pale-yellow leaf, but as the proportion of silver is lessened it becomes deeper in the yellow. Seen by transmitted light gold-leaf when only slightly alloyed appears green, but if it contains a large proportion of silver its colour is violet. For external gilding, leaf made from pure gold is the best, as it does not tarnish by atmospheric influences; but it is not so convenient for ordinary purposes.

Goldberg, a town of Prussian Silesia, on the Katzbach, 13 miles by rail WSW. of Liegnitz. It owes both origin and name to its former rich gold-mines; suffered much from Mongols and Hussites, the Thirty Years' War, the campaign of 1813, and finally from great fires (1863–74); and now has manufactures of cloth, flannel, &c. Pop. 6436.

Gold Coast, a British crown colony on the Gulf of Guinea, with an area of 15,000 square miles, or including protectorates, 46,600 square miles, and a population of 1,475,000 (of whom only 150 are Europeans). It extends from 5° W. to 2° E. long., between the Slave Coast and the Ivory Coast, has a coast-line of some 350 miles, and reaches inland to Ashanti (beyond the Prah), in which (at Kumasi) there is, since 1895, a British resident. Its shores are low and swampy, and very difficult of approach owing to the heavy surf. From the lagoons of the coast the country rises gradually towards the interior, and is furrowed by numerous small streams. The principal exports are palm kernels and oil, india-rubber, gold-dust, ivory, and monkey skins; but cocoa-nuts, copra, coffee, Calabar beans, corn, ground-nuts, Guinea grains, ginger, cam-wood, gum copal, tobacco, and porcupine quills are also produced. The climate on the coast is very unhealthy, but is better inland. The negro inhabitants are largely under the management of their own chiefs. The exports and imports have each an annual value of £600,000 or £700,000. The chief towns are Accra, Elmina, and Cape Coast Castle. The whole of the district geographically known as Gold Coast is British, except the French settlements of Grand Bassam, Assinie, Grand Lahou, and Jackeville. German Togoland is on the Slave Coast. See Ellis, *History of the Gold Coast* (1893), and Lucas, *Historical Geography of the British Colonies*, Vol. III. (1895).

Golden Age. See AGE.

Golden Beetle, the name popularly given to many members of a genus of coleopterous insects, Chrysomela, and of a sub-family, Chrysomelinæ, belonging to the tetramerous section of the order. The body is generally short and convex, the antennæ are simple and wide apart at the base; some of the species are destitute of wings. None are of large size, but many are distinguished by their metallic splendour of colour. The finest species are tropical, but some are found in Britain—e.g. the golden *C. cerealis* with purple stripes found on Snowdon, and the brassy-green *C. polita* and *C. staphylea* commonly found on nettles in spring. In north temperate countries some of the adults of the autumnal brood sleep through the winter, awakening in spring to reproductive functions. Some of

them, in the larval state, commit ravages on the produce of the field and garden.

Golden Bull (Lat. *bulla aurea*), so called from the gold case in which the seal attached to it was enclosed, was an edict issued by the Emperor Charles IV. in 1356, mainly for the purpose of settling the law of imperial elections. See GERMANY, ELECTORS, BULL.

Golden-crested Wren (*Regulus cristatus*), a very beautiful bird of the family Sylviidæ, the smallest of British birds. Its entire length is scarcely three inches and a half. Notwithstanding its English name, it is not really a wren, but this name continues in popular use rather than Regulus and Kinglet, which have been proposed instead. The golden-crested wren is greenish-yellow on the upper parts, the cheeks and throat grayish-white; the crown feathers elongated, and forming a bright yellow crest. In its habits it is intermediate between the warblers and the tits.

Golden-crested Wren (*Regulus cristatus*).

It particularly affects fir-woods. It is not uncommon in Britain, from the most southern to the most northern parts; but many come also from more northern countries to spend the winter, and it is on record that, in October 1822, thousands were driven on the coast of Northumberland and Durham by a severe gale from the north east. The nest of this bird is suspended from the outermost twigs of a branch of fir, some of them being interwoven with it.—Another species (*R. ignicapillus*), with more vividly red crest, is sometimes found in Britain, and species are found in Asia and North America.

Golden-eye Fly (*Chrysopa perla*), also called Lacewing Fly, a neuropterous insect, common in Britain; pale green, with long thread-like antennæ, long gauze-like wings, and brilliant golden eyes.

Golden-eye Fly (*Chrysopa perla*):
a, cocoon; *b*, the same magnified; *c*, larva; *d*, the same magnified, and freed from adhering substances; *e*, perfect insect, on a branch to which its eggs are attached.

Its flight is feeble. The length, from the tip of the antennæ to the tip of the wings, is almost an inch and a half, but the insect without wings and antennæ is not more than one-third of this. The female attaches her eggs, in groups of 12 or 16, by long hair-like stalks, to leaves or twigs, where they have been mistaken for fungi. The larvæ are ferocious-looking little animals, rough with long hairs, to which particles of lichen or bark become attached; they are called *aphis-lions*, and are very useful in the destruction of aphides, on which they feed. The pupa is enclosed in a white silken cocoon, from which the fly is liberated by a lid. The general facts above stated are also true of another very common species (*Ch. vulgaris*) a delicate green insect, with a body about half an inch long. The species of Chrysopa emit a very disagreeable odour. The nearly allied genus Hemerobius is also abundantly represented in Britain and elsewhere.

Golden Fleece (Fr. *toison d'or*), in Greek tradition, the fleece of the ram Chrysomallus, the recovery of which was the object of the famous expedition of the Argonauts (q.v.). The Golden Fleece has given its name to a celebrated order of knighthood in Austria and Spain, founded by Philip III., Duke of Burgundy and the Netherlands, at Bruges on the 10th January 1429, on the occasion of his marriage with Isabella, daughter of King John I. of Portugal. This order was instituted for the protection of the church, and the fleece was probably assumed for its emblem as much from being the material of the staple manufacture of the Low Countries as from its connection with heroic times. The number of the knights was thirty-one, and they themselves filled up vacancies by vote. This continued till 1559, when Philip II. of Spain held the last (the 23d) chapter of the order in the cathedral of Ghent; and subsequently Philip obtained from Gregory XIII. permission to nominate the knights himself. After the death of the last Hapsburg king of Spain in 1700, the Emperor Charles VI. laid claim to the sole headship of the order in virtue of his possession of the Netherlands, and, taking with him the archives of the order, celebrated its inauguration with great magnificence at Vienna in 1713. Philip V. of Spain contested the claim of Charles; and the dispute, several times renewed, was at last tacitly adjusted by the introduction of the order in both countries. The insignia are a golden fleece (a sheepskin with the head and feet attached) hanging from a gold and blue enamelled flint-stone emitting flames, and borne in its turn by a ray of fire. On the enamelled obverse is inscribed *Pretium laborum non vile*. The decoration was originally suspended from a chain of alternate flints and rays, for which Charles V. allowed a red ribbon to be substituted, and the chain is now worn only by the Grand master. The Spanish decoration differs slightly from the Austrian. The costume consists of a long robe of deep red velvet, lined with white taffetas, and a long mantle of purple velvet lined with white satin, and richly trimmed with embroidery containing fire-stones and steels emitting flames and sparks. On the hem, which is of white satin, is embroidered in gold, *Je l'ay empris*. There is also a cap of purple velvet embroidered in gold, with a hood, and the shoes and stockings are red. See Reiffenberg, *Histoire de l'Ordre de Toison d'Or* (1830); and Zoller, *Der Orden vom Goldenen Vlies* (1879).

Order of the Golden Fleece.

Golden Gate, a channel 2 miles wide, forming the entrance to the magnificent Bay of San Francisco, and washing the northern shore of the peninsula on which San Francisco is built. It is defended by Fort Point, at the north-western extremity of the peninsula, and by a fort on Alcatraz Island, inside the entrance.

Golden Horde. See KIPTCHAK.

Golden Horn. See CONSTANTINOPLE.

Golden Legend (Lat. *Aurea Legenda*), a celebrated medieval collection of lives of the greater saints, which passed through more than a hundred editions, and was rendered from Latin into most of the western languages. It is the work of Jacobus de Voragine (1230–98), a Dominican, who was Archbishop of Genoa for his last six years, and wrote many works, among them the *Chronicon Januense*, a history of Genoa from mythical down to contemporary times. The Golden Legend has 182 chapters, and is divided into five sections, corresponding to as many divisions of the year. It contains many puerile legends and contemporary miracles vouchsafed especially to Dominicans. A translation was made by William Caxton, and published in 1483. A good edition is that by Grasse (Dresden, 1846).

Golden Number for any year is the number of that year in the Metonic Cycle (q.v.); and, as this cycle embraces nineteen years, the golden numbers range from one to nineteen. The cycle of the Greek astronomer Meton (432 B.C.) came into general use soon after its discovery, and the number of each year in the Metonic cycle was marked in golden colours in the Roman and Alexandrian calendars. Hence the origin of the name. Since the introduction of the Gregorian calendar the point from which the golden numbers are reckoned is 1 B.C., as in that year the new moon fell on the 1st of January; and, as by Meton's law the new moon falls on the same day (1st of January) every nineteenth year from that time, we obtain the following rule for finding the golden number for any particular year. '*Add one to the number of years, and divide by nineteen: the quotient gives the number of cycles and the remainder gives the golden number for that year; and if there be no remainder, then nineteen is the golden number, and that year is the last of the cycle.*' The golden number is used for determining the Epact (q.v.) and the time for holding Easter (q.v.).

Common Golden-rod (a garden variety).

Golden Oriole. See ORIOLE.

Golden-rod (*Solidago*), a genus of Compositæ, closely allied to Aster. Only the common *S. Virgaurea* is British, a few others are European, but most (more than 100) belong to North America, where their bright colouring lightens up the beautiful autumnal scenery. Some—e.g. *S. canadensis*, *grandiflora*, &c.—are found in old-fashioned borders, but are so coarse and weedy as hardly to merit a place beyond the shady corner of the roughest shrubbery. *S. Virgaurea* had at one time a great reputation as a vulnerary, whence probably the name (from Lat. *solidare*, 'to unite'). The leaves of this and a fragrant North American species, *S. odora*, have been used as a substitute for tea. They are mildly astringent and tonic.

Golden Rose, a rose formed of wrought gold, and blessed with much solemnity by the pope in person on the fourth Sunday in Lent, which is called, from the first word in the service for the festival, 'Lætare Sunday.' The rose is anointed with balsam, fumigated with incense, sprinkled with musk, and is then left upon the altar until the conclusion of the mass. It is usually presented to some Catholic prince, whom the pope desires especially to honour, with an appropriate form of words. The practice seems to have originated in the 13th century. Amongst recipients have been Henry VIII. (three times), Queen Mary of England, Maria Theresa, Napoleon III., and Isabella II. of Spain.

Gold-eye, or MOON-EYE (*Hyodon tergisus*), a peculiar fish, abundant in the western rivers and lakes of North America. It has many technically interesting peculiarities of structure, and forms a family by itself in the Physostomi order of bony fishes. It measures about a foot in length.

Goldfinch (*Carduelis elegans*), the most beautiful of British finches (Fringillidæ). It is about five inches in length; has a thick, conical, sharp-pointed bill; and is noteworthy among British birds for its handsome plumage, in which black, crimson-red, yellow, and white are, in the adult male, exquisitely mingled. The female has less crimson on the throat and no yellow on the breast, and the 'gray-pate' or 'bald-pate' young are also of course much less gaily adorned than the full-grown males.

Goldfinch (*Carduelis elegans*).

Goldfinches occur in small flocks on open uncultivated ground, feeding on thistles and other composites, or are found breeding in gardens and orchards. The nest, usually in a fruit-tree, is even neater than that of the chaffinch, lined with the finest down, but without lichens; the eggs (4 or 5) are grayish-white, with purplish-brown streaks and spots; there are two broods in the year; the young are fed on insects. The goldfinch is still a common summer bird in Britain, especially in the south; most migrate southwards in October. It breeds throughout Europe, especially in the south, and ranges from the Canaries, through North Africa, to Persia. Its soft pleasing song, intelligence, docility, liveliness, and lovingness make it, to its cost, a favourite cage-bird. See Howard Saunders, *Manual of British Birds*.

Goldfish, or GOLDEN CARP (*Carassius auratus*), a Chinese and Japanese fresh water fish nearly allied to the carp (*Cyprinus*), but lacking barbels. In its warm native waters it is brownish, like its neighbour species, the Crucian Carp (*C. carassius*), while in its more familiar domesticated state it loses the black and brown pigment, becomes golden yellow, or passes more completely into albinism in those unpigmented forms known as silver fish. Young specimens are dark in colour, the loss of pigment and the consequent golden tint becoming marked as they grow older. It seems to have been introduced into England in 1691, and is often kept in aquaria, or with more success in ponds, especially in such as are warmed by an inflow of hot water from engines. In temperatures of 80° F. or more it thrives well and breeds abundantly. The goldfish is naturalised in some continental rivers, and has had a wide artificial distribution throughout the world. In aquaria the fish are best fed on worms, insects, and the like, and care must be taken that the water is kept fresh. Monstrosities such as double or multiple tails or much modified fins frequently occur in artificial conditions. Of these the most remarkable is the 'telescope fish.' There are large breeding-establishments in southern and western France, in various parts of Prussia, and at Palz in Styria the latter furnishing 100,000 goldfish in a year. See Mulertt, *The Goldfish and its Systematic Culture* (1884).

Gold Hill, a settlement in Nevada, now part of Virginia City (q.v.), which, on Mount Davidson, is the famous Comstock Lode (q.v.).

Goldilocks is a common name for the *Ranunculus auricomus*. See RANUNCULUS.

Gold Lace. This term is applied in a general way to more than one kind of fabric made of thread covered with gilt silver wire. The 'gold wire' used in the manufacture of gold thread is nearly always in India, where a great deal is made, composed of pure silver with a thin coating of gold. But in European countries it is only the very best qualities of this wire which are made of unalloyed silver. A good quality of English gold thread is made from wire consisting of one part of copper added to twenty-five of silver, which is afterwards coated with gold. But alloys of copper and silver in many proportions are used, some wire containing only one part of silver to sixty of copper. The silver, or alloy of copper and silver, is made into a rod 1½ inch in diameter, and then annealed and polished to prepare it for its coating of gold. This is laid on in the form of leaves of pure gold, and subjected, for the best qualities of wire, to the fire-gilding process—i.e. the gold-coated rod is heated to redness on burning charcoal, which causes the leaf to adhere firmly. Rods so treated are next smeared with wax, and drawn through the holes of a steel drawplate (see WIRE, in Vol. X.). The wire is frequently annealed during the process of drawing, and this requires to be very skilfully done, or the golden tint of the surface is lost. Gold wire for thread is generally drawn down to a size measuring 1100 to 1400 yards to the ounce of metal. Finer sizes reach the length of 1800 to 2000 yards to the ounce, and to attain this fineness the wire is drawn through perforated gems, such as diamonds or rubies. The fine wire, after being annealed, is flattened between polished steel rollers. Finally the flat wire, or rather ribbon, is wound over yellow or orange coloured silk, so as completely to envelop it, by a spinning engine. The gold thread is then finished. Some of the best qualities of the metal covering or 'plate' of this thread have 12 dwt. of gold to the pound of silver or of alloy. Inferior kinds have as little as 2 dwt. to the pound, and still cheaper sorts of thread are covered with flattened copper wire which has received a thin coating of electro-deposited silver, and this afterwards receives, on the outside of the thread only, a still thinner electro-deposited coating of gold—two grains of the precious metal covering 3000 square inches of surface. For this very cheap kind of thread yellow cotton is used instead of silk.

The only difference between gold and silver thread is that the thin coating of gold is wanting on the latter. Gold thread is used in the manufacture of military lace, which is made in several patterns for officers of different ranks and for various divisions of the army and navy. This, however, is a woven substance and not true lace; but some real lace is made both of gold and silver thread. Both kinds of thread are also used for facings of liveries, and for ecclesiastical robes, altar cloths, and banners. These and other fabrics are either embroidered or woven, but often only in part, with the thread (see BROCADE, DAMASK, and EMBROIDERY). Much of the 'gold thread' used for theatrical dresses and decorations has only a covering of Dutch Metal (q.v.), and the 'silver thread' in these is spun with a covering of a cheap white alloy, having a mere film of silver on the surface.

Gold Leaf. See GOLD BEATING.

Gold of Pleasure (*Camelina*), a small genus of Cruciferæ. The common Gold of Pleasure (*C. sativa*; Fr. *Cameline*, Ger. *Dotter*) is an annual plant of humble appearance, but with abundant yellow flowers. It is most commonly known as a weed in lint-fields, although it is also cultivated alone or mixed with rapeseed in parts of Germany, Belgium, and the south of Europe for the sake of the abundant oil contained in its seeds. Its seeds and oil-cake are, however, inferior to those of lint, and its oil is apt to become rancid and is less valued than that of rape or colza. The value of the plant in agriculture depends much on its adaptation to poor sandy soils, and on the briefness of its period of vegetation, adapting it for being sown after another crop has failed, or for being ploughed down as a green manure. The crop is cut or pulled when the pouches begin to turn yellow; but the readiness with which seed is scattered in the field, rendering the plant a weed for future years, is an objection to its cultivation. The stems are tough, fibrous, and durable, and are used for thatching and for making brooms; their fibre is sometimes even separated like that of flax, and made into very coarse cloth and packing-paper. The seeds are used for emollient poultices. *C. dentata* is of similar habit and properties, but is not cultivated.

Goldoni, CARLO, the creator of the modern Italian comedy of character and domestic life, was born in 1707 at Venice. Although he went through a course of law studies there and at Pavia, his heart was set even from a child upon plays and playwriting. His first serious attempts were tragedies, one of which, *Belisario*, was successful at Venice in 1732. But he soon discovered that his forte was comedy rather than tragedy, and set himself to effect a revolution in the Italian comic stage. At that time the popular comedies in Italy were really farces, in which pantaloon and harlequin filled the principal rôles, acting with masks on their faces, and trusting very largely to the inspiration of the moment for their buffooneries and pranks. For this style of thing Goldoni determined to substitute the comedy of character according to Molière, and a hard task he set himself. Several years were now spent by him wandering from city to city of North Italy, sometimes practising his profession, but always in

intimate connection with companies of actors, for whom he wrote various comedies, until in 1740 he settled in Venice. Then for twenty years he poured forth comedy after comedy. In 1761 he made an engagement for two years to write for the Italian theatre in Paris, and for that purpose moved to the French capital. On the conclusion of this engagement he was appointed teacher of Italian to the daughters of Louis XV., and remained attached to the court until the Revolution. He died 6th February 1793. Goldoni's comedies, more than 120 in number, some of the best of which are the *Villeggiatura* trilogy, *Locandiera*, *Le Baruffe Chiozzotte*, *Zelinda e Lindoro*, *Ventaglio*, *La Bottega di Caffè*, and *Dama Prudente*, were for the most part put together too rapidly and too roughly to be adjudged first-rate. But, though they seldom touch more than the external and superficial aspects of life and society, they are marked by considerable skill in character-sketching, by faithful representation of contemporary manners, lively dialogue, and cleverness in the invention of comic situations. Goldoni wrote *Mémoires* of his own life (1787), and published at Venice in 1788–89 the first collected edition of his own works in 44 vols. (3d ed. Florence, 53 vols. 1827). His correspondence has been edited by Masi (1880) and Mantovani (1884). See Lives by Molmenti (1879) and Galanti (2d ed. 1883), and Vernon Lee, *Studies of the Eighteenth Century in Italy* (1880).

Goldschmidt, Madame (Jenny Lind), a celebrated Swedish singer, was born of humble parentage at Stockholm, October 6, 1820. Her musical gifts were apparent from her third year, and at nine she was admitted to the school of singing attached to the court theatre, where she received lessons of Berg and others. She sang before the court with success, and at eighteen appeared in the rôle of Agatha in *Der Freischutz*, Alice in *Robert le Diable*, &c., and soon became the principal support of the royal theatre. In June 1841 she went to Paris to receive lessons from Garcia. Meyerbeer, who heard her at this time, prophesied a brilliant future for Jenny Lind. Her voice was tested with success in private in the Grand Opera, and erroneous rumours of failure were current. She had already been engaged for the Stockholm Opera (1842). In 1844 she went to Berlin, and for a time studied German; returning to Stockholm, she was heard with enthusiasm in *Robert le Diable*, and at the instance of Meyerbeer was engaged at Berlin in October, appearing in *Norma* and Meyerbeer's operas. In 1846 she visited Vienna, in 1847 London. Prices at Her Majesty's rose to a fabulous height, and 'the town,' says Chorley, 'sacred and profane, went mad about the Swedish Nightingale.' Her voice at this time has been described as a soprano of bright, thrilling, and remarkable sympathetic quality, with wonderfully developed length of breath, and perfection of execution. She could sing up to high D in rich, full tones, and even touch higher notes; she literally warbled like a bird; and especially striking was her rendering of the weird Swedish melodies. Her return visit to London in 1848 was an immense triumph; and in London, on 18th May 1849, she sang on the stage for the last time in *Roberto;* henceforth her appearances were confined to the concert-room. Her share of the profits of a brilliant concert tour in America under Barnum's management (1849–52), amounting to £35,000, was more than spent afterwards in founding and endowing musical scholarships and charities in her native country. In 1851 she was married at Boston to Otto Goldschmidt, a native of Hamburg, her pianist. Returning to Europe, she continued to sing at concerts and in oratorios, as in London (1856), and for the last time at Düsseldorf (1870). Her English charities included the gift of a hospital to Liverpool and of the wing of another to London. She founded the Mendelssohn scholarship, and her interest in the Bach Choir, of which her husband was conductor, was shown by her careful training of the female chorus. Her voice retained its sweetness to the last, although she did not care to sing much even in the semi-privacy of a crowded drawing-room. But from 1883 till 1886 she was professor of Singing at the Royal College of Music. She died near Malvern, November 2, 1887. Her moral character was elevated and deeply religious; her smile was described as heavenly. See the Memoir by Canon Scott Holland and W. S. Rockstro (2 vols. 1891).

Goldsinny, or Goldfinny (*Crenilabrus melops*), also called the Cork-wing, a small fish of the Wrasse family (Labridæ), common on British coasts. Like other members of its family, it haunts the neighbourhood of rocks, feeding on crustaceans, molluscs, and the like. In colour it is more or less green or yellow, darker above, striped along the sides, with a dark spot on the tail. Like young wrasse, but unlike the adults, it has a serrated bone (preoperculum) on the side of its gill-cover.

Goldsmith, Oliver, was born at Pallas, in Longford, Ireland, on the 10th November 1728, his father, the Rev. Charles Goldsmith, a clergyman of the established church, being at that time curate to the rector of Kilkenny West. When six years old Goldsmith was placed under Thomas Byrne, the schoolmaster described in the *Deserted Village*. After an attack of smallpox, he went successively to various local schools, ultimately entering Trinity College, Dublin, as a 'sizar,' or poor scholar, on the 11th June 1744. As yet he had shown no exceptional ability, nor did he show any at the university. His tutor was rough and unsympathetic; he himself was pleasure-loving and poor. His father died, and his circumstances grew worse. In 1747 he was involved in a college riot, and, escaping from the consequences of this only to fall into further disgraces, finally ran away from his Alma Mater. Matters being patched up by his elder brother, he returned, taking his B.A. degree, 27th February 1749. His uncle, the Rev. Mr Contarine, now his chief friend, wished him to qualify for orders, but he was rejected by the bishop of Elphin. Thereupon he made a false start for America. Getting no farther than Cork, he was next equipped with £50 to study law in London. This disappeared at a Dublin gaming-table. In 1752 he started for Scotland to study physic. Reaching Edinburgh, he stayed there nearly two years, leaving, however, behind him more legends of his social gifts than his professional acquirements. From Edinburgh he drifted to Leyden, again lost at play what little money he had, and finally set out to make the 'grand tour' on foot. After wandering through Flanders, France, Germany, and Italy, and obtaining, either at Louvain or Padua, a dubious degree as M.B., he returned to England in February 1756, with a few halfpence in his pockets. It is thought he tried strolling; it is certain that he was assistant to an apothecary. Then, with the aid of an Edinburgh friend, he practised as a poor physician in Southwark—a profession which he speedily quitted for that of proof-reader to Richardson, in turn abandoning this to be usher in Dr Milner's 'classical academy' at Peckham. At Dr Milner's he became acquainted with Griffiths, the proprietor of the *Monthly Review*, who engaged him as author of all-work. His bondage to Griffiths lasted only a few months. His next mode of subsistence is obscure, but in February 1758 appeared his first definite work, a translation in two volumes of the Memoirs

of Jean Marteilhe of Bergerac, a 'Protestant condemned to the galleys of France for his religion.' For this he used the name of a schoolfellow, James Willington, but the book is known to have been his own. After its appearance he went back to Peckham, to wait for an appointment on a foreign station, which Dr Milner had promised to obtain for him. To procure the funds for his outfit he set about an *Enquiry into the Present State of Polite Learning in Europe*. From some unexplained cause, however, his nomination, when received, fell through, and in December we find him endeavouring to pass at Surgeons' Hall for the humbler post of hospital mate, but without success. What was worse, the clothes he went up in had been obtained on the security of his old employer Griffiths; to pay his landlady he pawned them, and the angry bookseller threatened him with a debtor's prison.

Shortly afterwards, in April 1759, the *Enquiry* was published. It attracted some notice, and better days at length dawned on Goldsmith. He started the periodical called *The Bee* (1759), and contributed to *The Busy Body* and *The Lady's Magazine*. Then came to his miserable lodging in Green Arbour Court, Old Bailey, overtures from Smollett, and John Newbery, the bookseller. For the *British Magazine* of the former he wrote some of his best essays; for the *Public Ledger* of the latter the celebrated *Chinese Letters* (afterwards published as *The Citizen of the World*), which appeared in 1760–61. In May of the latter year he moved to 6 Wine Office Court, Fleet Street, where, on the 31st of the same month, he was visited by Johnson. In 1762, among other things, he published a *Life of Richard Nash*, the Bath master of the ceremonies; and he sold to Benjamin Collins, a Salisbury printer, a third share in the yet-unpublished *Vicar of Wakefield*. In 1764 the 'Club,' known many years afterwards as the 'Literary Club,' was founded; and he was one of its nine original members. His next work was an anonymous *History of England, in a Series of Letters from a Nobleman to his Son*. This was followed in December 1764 by *The Traveller*, a poem which at once raised him to a foremost place among the minstrels of the day. Two years later, in March 1766, appeared *The Vicar of Wakefield*, by which his reputation as a novelist was secured. The stage alone remained untried, and this, after two more years of preface writing and journey-work, he attempted with *The Good Natured Man*, a comedy, produced at Covent Garden in January 1768. It was a moderate success. But he again escaped from enforced compilation (Histories of Rome and England, *History of Animated Nature*) with his best poetical effort, *The Deserted Village* (1770); and three years afterwards achieved the highest dramatic honours by *She Stoops to Conquer*, still one of the most popular of English acting comedies. A year later (April 4, 1774) he died in his chambers at 2 Brick Court, Middle Temple, of a fever, aggravated by the obstinacy with which he had relied upon the popular remedy known as 'James's powder.' He was buried on the 9th, in the burial-ground of the Temple Church, in the triforium of which is a tablet to his memory. The club erected a monument to him in Westminster Abbey. In the year of his death was published the unfinished series of rhymed sketches of his friends, called *Retaliation*, and in 1776 the *jeu d'esprit*, entitled *The Haunch of Venison; an Epistle to Lord Clare*.

Poor in his youth, Goldsmith was not prudent in his more prosperous middle age. He died £2000 in debt, and there is reason for supposing that his difficulties embittered his latter days. When his doctor asked him on his deathbed if his mind was at ease, he replied that it was not. As a man, Goldsmith had some constitutional disadvantages and many obvious faults, mostly of a harmless kind. But he was thoroughly warm-hearted and generous, and full of unfeigned love and pity for humanity. As a writer, in addition to the most fortunate mingling of humour and tenderness, he possessed that native charm of style which neither learning nor labour can acquire. In the felicitous phrase which Johnson borrowed from Fénelon for his epitaph, he touched nothing which he did not adorn. Prior first collected the material for his biography in 1837; in 1848 Forster prepared from this (not without expostulation on Prior's part) his well-known life. Washington Irving's genial sketch of 1849 was based upon Forster. Later memoirs are that by W. Black in the 'Men of Letters' series (1879), and by the present writer in the 'Great Writers' (1888). The last contains a bibliography; and a special bibliography of *The Vicar of Wakefield* is prefixed to the fac-simile edition of that book issued in 1885. The most modern edition of Goldsmith's complete works is that by Gibbs (5 vols. 1884–86).

Goldstücker, Theodor, Sanskrit scholar, was born of Jewish parents on 18th January 1821, at Königsberg, studied there, at Bonn, and at Paris, and established himself as *privat-docent* at Berlin. He came to England in 1850 on the invitation of Professor H. Wilson, and in 1852 was appointed professor of Sanskrit, University College, London, a post he held till his death, 6th March 1872. Founder of the Sanskrit Text Society, he was an active member of the Philological and Royal Asiatic Societies. He wrote all the most important articles on Indian mythology and philosophy (67 in number) in the first edition of this Encyclopædia, and contributed to the *Athenæum* and *Westminster Review*. Of his separately-published works the most notable are *Panini: his Place in Sanskrit Literature* (1861); the Sanskrit text of the Jauninîya-Nyâya-Mâlâ-Vistara (completed by Professor Cowell); and part of a great Sanskrit Dictionary. He projected numerous other works, including a text of the Mahâbhârata, for which he had made vast collections of materials. His *Literary Remains* (2 vols. 1879) comprises, with other papers, the articles contributed to *Chambers's Encyclopædia*.

Gold-thread, the popular name in America for *Coptis trifolia*, a ranunculaceous plant found from Denmark to Siberia, and over the North American continent through Canada into the United States. The leaves are evergreen and like those of the strawberry, but smaller; the flowers are small and white. The name 'gold-thread' is given to the abundant silk-like root-stocks, still a popular remedy among the French Canadians for ulcerated throats.

Goletta (Fr. *La Goulette*), the port of the city of Tunis, from which it is 11 miles N. by rail or canal. In the new quarter are the bey's palace, a large dock, and an arsenal defended by a battery. The population, usually about 3000, is trebled during the visit of the bey in the bathing season; the proportion of Europeans has greatly increased, and many of the houses are now built in the European style. The harbour, though by no means secure, was long the most frequented in Tunis; but after the establishment of a French protectorate some of the trade passed to Bona, in Algeria; and since the completion of the ship canal to Tunis (q.v.), and the deepening of the harbour there in 1893, La Goletta has greatly decayed.

Golf, a Scottish pastime (also *gaff* or *goaf*—the latter the vernacular pronunciation; the name being usually connected with the Dutch *kolf*, 'club'), is

certainly of great antiquity, and frequent references are made to it in old Scottish records. In 1457 the Scottish parliament passed an act enjoining that 'Fute ball and Golfe be utterly cryit downe, and nocht usit, and that the bowe merkis be maid at ilka paroche kirke a paire of buttis, and schuttting be usit ilk Sunday.' A similar act was passed in May 1491. It thus appears that the game was at one time so popular in Scotland that the more important practice of archery, for the defence of the country, stood in danger of being neglected. In 1592 the magistrates of Edinburgh issued a proclamation against playing the game on Sunday.

Reference is made to golf on Leith Links in *A Diurnal of Occurrents within Scotland, 1546–75* (Maitland Club, 1832), and it appears to have been practised by all classes in the reign of King James VI. Charles I. was much attached to the game, and on his visit to Scotland in 1641 was engaged in it on Leith Links when intimation was given him of the rebellion in Ireland, whereupon he threw down his club, and returned in great agitation to Holyrood House. The Duke of York, afterwards James II., also delighted in the game.

Until late years golf was entirely confined to Scotland, though the oldest existing golf club was founded by James I. at Blackheath in 1608; but now it is firmly established south of the Tweed, and clubs have been formed in almost every locality in England where the ground is at all suitable for the game. Golf is played at several stations in India, as well as in Canada and Cape Colony; and clubs were formed at Cairo in 1888 and at San Francisco in 1889. Ladies' golf clubs exist in a flourishing condition at St Andrews, North Berwick, Westward Ho, &c. The game is played on what are called in Scotland *links* (Eng. *downs*)—i.e. tracts of sandy soil covered with short grass, which occur frequently along the east coast of Scotland. The best Scotch golfing links are St Andrews and Leven in Fife, Prestwick in Ayrshire, Machrihanish in Argyllshire, North Berwick and Gullane in East Lothian, Carnoustie and Montrose in Forfarshire, and Dornoch in Sutherland. In England the most important centres are Hoylake near Liverpool, Westward Ho in Devonshire, Wimbledon near London, and Sandwich in Kent. All of these are examples of admirably suited links, as the ground is diversified by knolls, sand-pits, and other *hazards* (as they are termed in golfing phraseology), the avoiding of which is one of the most important points of the game.

A series of small round holes, about four inches in diameter, and several inches in depth, are cut in the turf, at distances of from one to five or six hundred yards from each other, according to the nature of the ground, so as to form a circuit or *round*. The round generally consists of either nine or eighteen holes as the length or nature of the course may allow. The links of St Andrews contain eighteen holes, and two hours are occupied in completing the round. The rival players are either two in number, which is the simplest arrangement, or four (two against two), in which case the two partners strike the ball on their side alternately. The balls, weighing somewhat under two ounces, are made of gutta-percha, and painted white so as to be readily seen.

An ordinary golf-club consists of two parts spliced together—viz. the shaft and head: the shaft is usually made of hickory or lancewood; the handle covered with leather; the head (heavily weighted with lead behind, and with a slip of horn along the front of the sole) of well-seasoned apple-tree or beech. Every player has a *set* of clubs, differing in length and shape to suit the distance to be driven and the position of the ball; for (except in striking off from a hole, when the ball may be *teed*—i.e. placed advantageously on a little heap of sand, called a *tee*) it is a rule that the ball must be struck as it happens to lie. Some positions of the ball require a club with an iron head. The usual complement of clubs is about seven; but those who refine on the gradation of implements use as many as ten, or even twelve, which are technically distinguished as the *driver*, *long-spoon*, *mid-spoon*, *short-spoon*, *brassey*, *putter*, *iron*, *lofting-iron*, *mashie*, *iron-putter*, *cleek*, and *niblick*: the last six have iron heads, the others are of wood. Every player is usually provided with an attendant, called a *caddy*, who carries his clubs and 'tees' his balls. Since the game has become so generally popular, many modifications and inventions in clubs have been introduced. The earliest and most permanent of these is the 'bulger' form of wooden club heads. The bulger-head is shorter and rounder than the old form, and from its general acceptance would seem to have answered its purpose of giving greater power in driving. The others are mostly in the way of iron clubs, and except the 'mashie,' a useful short-headed pitching iron, are too numerous (and in many cases fantastic) to specify.

Club Heads:
1, driver; 2, mid-spoon; 3, putter; 4, cleek; 5, iron; 6, niblick.

Commencing at a spot a few yards in front of the home hole—the *teeing* ground—each player drives off his ball in the direction of the first hole, into which he does his best to put the ball in fewer strokes than his antagonist. If the players put their balls in in an equal number of strokes, the hole is said to be *halved*, and scores to neither; but if one, by superior play, holes his ball in fewer strokes than the other, he gains that hole, and so takes precedence (the *honour*) in striking off towards the next. In this manner they proceed till the entire round is finished, the match being gained by the player who has achieved the greater number of holes. Sometimes the interest of a match is maintained till the very last, by a succession of evenly-played holes, or by each having gained an equal number during the round. 'All even on the day's play' may also be declared where each party has won the same number of rounds as his antagonist, or antagonists. A match may also consist of a certain number of holes independently of rounds, when it of course accrues to the winner of the greater number of holes. In contests between professional players the match usually consists of a certain number of holes to be contested on more links than one.

Throughout the entire game, he whose ball lies farthest from the hole which he is approaching invariably plays before his more advanced companion. We have already said that the player who 'holes' his ball in fewer strokes

than his rival wins that hole. Now, if it is agreed that the match shall fall to the player who holes the entire round in fewest *strokes*, as in playing for medals or other prizes, each stroke is scrupulously recorded, and scored on a card; but if the match is to be yielded to the winner of the *greatest number of holes* in a round, the number of actual strokes need not necessarily be reckoned. Golf, like all other games, has its especial phraseology. Thus, he who is about to play the same number of strokes as his antagonist has already played, plays *the like*; if he is about to play one stroke more than his rival has already played, he plays *the odds*; if one stroke less, he plays *one off two*; if two strokes more, *two more*, and so on. This method of reckoning, though somewhat confusing at first, is after a little time easily acquired; and, from its being universally adopted on golfing courses, should receive especial attention. In the accompanying illustrations the method of holding the club when driving, and the swing, are shown.

Method of holding the Club in driving.

The Swing in driving.

To play the game of golf well requires long practice, and very few attain to great excellence who have not played from their youth. But any one may in a year or two learn to play tolerably, so as to take great pleasure in the game; and for all who have once entered upon it it possesses no ordinary fascination. It has this advantage over many other outdoor games, that it is suited for both old and young. The strong and energetic find scope for their energy in driving long balls (crack players will drive a ball above 200 yards); but the more important points of the game—an exact eye, a steady and measured stroke for the short distances, and skill in avoiding hazards—are called forth in all cases. Along with the muscular exercise required by the actual play, there is a mixture of walking which particularly suits those whose pursuits are sedentary—walking, too, on a breezy common, and under circumstances which make it far more beneficial than an ordinary 'constitutional.'

Golf associations are numerous in Scotland, and in most cases are governed by the rules laid down by the Royal and Ancient Golf Club of St Andrews (1754), which is the chief, and one of the oldest clubs in the country. These rules have been very generally adopted all over England. English golfers are at the same time much indebted to the exertions of the late Mr George Glennie, sometime captain of the Royal Blackheath Golf Club, for keeping the game alive at Blackheath while for many years it was unknown elsewhere in the south; and it was mainly his fostering influence which promoted its growth on other southern greens. Many professional players make their livelihood by golf, and are always ready to instruct beginners in the art, or to play matches with amateurs. Among the most famous professional golfers were Allan Robertson (died 1859), and latterly young Tom Morris (died 1875). 'Amateur' and 'open' championship meetings are held annually on different greens in Scotland and England. The first championships were held alternately by old Tom Morris and Willie Park, sen., for many years. 'Young' Tom Morris was the only player who, winning the trophy three years consecutively, became its permanent possessor.

For information concerning the rules of golf and the history of the game from the earliest records, see *Golf: a Royal and Ancient Game*, by Robert Clark (Edin. 1876; new ed. 1894); *Golfing* (W. & R. Chambers: Edin. 1887); *The Art of Golf*, by Sir W. Simpson (Edin. 1888); *Golf* in the 'Badminton Library,' by H. Hutchinson, A. J. Balfour, A. Lang, Sir W. Simpson, and others.

Golgotha. See CALVARY.

Goliath Beetle (*Goliathus*), a genus of tropical Lamellicorn beetles, in the sub-family Cetoniidæ. They are distinguished by their large size, by the horny processes on the heads of the males, and by

Goliath Beetle.

the toothed lower jaws or maxillæ. Several species frequent tropical and South Africa, and related genera occur in tropical Asia. The male of the largest form, *Goliathus druryi*, from the Gold Coast, measures about four inches in length. In colour, as well as size, these goliaths and their relatives are splendid insects. The family Cetoniidæ

is familiarly represented in Europe and Britain by the Rosechafer (*Cetonia aurata*).

Göllnitz, or GOLLNICZBANYA, a mining town of Hungary, in the county of Zips, 17 miles SW. of Eperies. It has important iron and copper mines, and ironworks. Pop. 4353.

Gollnow, a town of Prussia, in Pomerania, is situated 15 miles NE. of Stettin. It was formerly a Hanse-town; it now has limekilns and a trade in timber. Pop. 8430.

Golomynka (*Comephorus* or *Callionymus baikalensis*), a remarkable fish, found only in Lake Baikal, the only known species of its genus, which comes near the gobies, but is the type of a distinct family. It is about a foot long, is destitute of scales, and is very soft, its whole substance abounding in oil, which is obtained from it by pressure. It may be almost said to melt into oil on the application of fire. It is never eaten.

Goloshes (Fr. *galoche*, 'a patten, clog, or wooden shoe;' from the Low Lat. *calopedia*, 'a clog,' and the Gr. *kalopous*), india-rubber overshoes which were introduced into Great Britain from America about the year 1847. At first clumsily made, and of inferior quality, they were, mainly by the exertions of the Hayward Rubber Company in America, soon much improved in quality and appearance, and the demand for them increased rapidly. The largest manufactory for the production of vulcanised rubber goloshes and other shoes in Great Britain is that of the North British Rubber Company at Edinburgh, where more than 100 distinct kinds of boots and shoes are made, and the production amounts to several thousand pairs a day.

The rubber is (1) torn up into small pieces, washed, and rolled together in granulated sheets; (2) it is then mixed, by the aid of heated rollers, with the vulcanising materials, consisting of sulphur, litharge, lampblack, pitch, rosin, and sometimes other materials; (3) the final stage in the preparation of the material is carried out after the shoes are made, and consists in subjecting them for nine hours to a temperature of between 200° and 300° F. Rubber so treated is said to be vulcanised (see INDIA-RUBBER). The so far prepared sheets of material are again rolled out between the heated rollers, till they are of the required thickness for the shoe uppers. Both soles and uppers for each shoe are cut out separately with a knife. The calico or other linings are coated round the edges with some strongly adhesive cement, probably dissolved rubber, and then all the pieces are ready to be put together. The earlier part of the work is done by men, but women actually make the shoes. A clever girl will make forty pairs a day; a very clever one fifty. That is to make a pair of shoes in ten or twelve minutes.

The chief defect of goloshes is that they keep the stockings constantly damp, and the feet uncomfortable, by preventing the escape or the absorption of the perspiration. Various modifications of the ordinary goloshes are made: thus, there is a kind with warm felt lining; another kind have felt or cloth uppers and ankles, and are often called snow-shoes.

Gomar, FRANCIS, theologian, and leader of the party who opposed most zealously the doctrines of Arminius (q.v.). Gomar, or Gomarus, was born at Bruges, 30th January 1563, studied at the universities of Strasburg, Heidelberg, Oxford, and Cambridge, in the last-mentioned of which he took his degree of B.D. in 1584. In 1594 he was appointed professor of Divinity at Leyden, and signalised himself then and ever after by his vehement antipathy to the views of his colleague, Arminius. At the synod of Dort in 1618 he was mainly instrumental in securing the expulsion of the Arminians from the Reformed Church. He died as professor at Groningen, 1641. An edition of his works was published at Amsterdam in 1645 and 1664.

Gombroon, called also BENDER ABBAS, a seaport of Persia, in the province of Kirman, stands on the Strait of Ormuz, opposite the island of that name. Bender Abbas owed its name and importance to Shah Abbás, who, assisted by the English, drove the Portuguese in 1622 from Ormuz, ruined that seaport, and transferred its commerce to Gombroon. For a while the new town prospered; but at present it is a wretched place of about 8000 inhabitants, mostly Arabs, who trade to the extent of £450,000 per annum in piece goods, sugar, tea, and pottery (imports), and in carpets, wool, tobacco, saffron, opium, almonds, and madder (exports).

Gomera, one of the Canary Islands (q.v.).

Gomorrah. See SODOM AND GOMORRAH.

Gonad, a technical name for reproductive organs. See REPRODUCTION.

Gonaïves, a seaport of Hayti, on a beautiful bay on the west coast, with an excellent harbour, 65 miles NNW. of Port au Prince. It exports coffee, cotton, logwood, and hides. Pop. (1897) 18,000.

Goncourt, EDMOND and JULES DE, a pair of French novelists, born, the former at Nancy, May 26, 1822, the latter at Paris, 17th December 1830. They were not men of letters but artists primarily, and in 1849 they set out knapsack on back to traverse France for drawings and water-colours. Their notebooks made them writers as well as artists, and already in 1852 they had commenced that literary partnership which after twenty years of obscure labours was to conquer the public and stamp its impression upon the modern novel more strongly than any one had done since Balzac. Their earliest serious works were a group of historical studies upon the second half of the 18th century, intended to be an effective resurrection of its habits of life, manners, and costume. With all their elaboration of details these were ineffective and superficial from their lack of the calm and impartial historical sense, to say nothing of the absence of more essential qualities still—breadth of view, and that creative grasp of character by sympathetic insight which is the rarest gift of the historian. The tilting of the 'Castor and Pollux of *bric-à-brac*' against the gigantic figures of the Revolution was almost too pitiful to be amusing. These books were *Histoire de la Société Française pendant la Révolution* (1854), *La Société Française pendant le Directoire* (1855), *Portraits intimes du XVIII^e Siècle* (1856-58), *Histoire de Marie Antoinette* (1858), *Les Maîtresses de Louis XV.* (1860), *La Femme au XVIII^e Siècle* (1862), and *L'Amour au XVIII^e Siècle* (1875). Of much more real value is *Gavarni* (1873), *L'Art au XVIII^e Siècle* (1874), and the later books devoted to Watteau (1876) and Prudhon (1877).

But the important work of the De Goncourt brothers commenced when they assumed the novel as the mould into which to pour the metal of their prolonged and exact observation. Their conception of the novel was that it should be an imaginative attempt to grasp and summarise the results of this; and the task they put before themselves was to unite by means of a plot such as might have happened a multitude of observed facts, and to cast around these an atmosphere which should illumine them. Their aim was to paint manners by taking the traits in which one man resembles a class, rather than to grasp personal character by the points wherein one man is distinguished from another, in the manner of Balzac or George Eliot. Hence they select as generic types only persons of moderate faculties, and herein they are poorer than nature

herself, which not only creates classes and groups but exceptional figures also. Their figures submit to life without subduing it, and are weighed down by that irresoluteness of will and morbid sensitiveness to suffering which is the especial disease of our age. Their subject is not so much the passions as the manners of the 19th century, and their sense of the enormous influence of environment and habit upon man necessitated so close a study of the arts of contemporary life that their work will be valued by future historians as a storehouse of materials. Their descriptive part is always especially prominent, and their stories usually commence without explanation and end without denouement.

The novels in which the brothers carried out their theories display a marvellous unity, despite their double origin. The first, *Les Hommes de Lettres* (1860; new ed. as *Charles Demailly*), was followed by *Sœur Philomène* (1861), *Renée Mauperin* (1864), *Germinie Lacerteux* (1865), *Manette Salomon* (1867), and *Madame Gervaisais* (1869). The last is their greatest novel, the sharp and painful analysis of which was too close a reflex of themselves. Indeed, the weaker of the two did not survive this book, which may be said to have been written with his heart's blood. After the death of Jules, 20th June 1870, Edmond (who lived till 12th July 1896) issued *La Fille Elisa* (1878), *La Faustin* (1882), and *Chérie* (1885). The *Idées et Sensations* (1866) had already revealed to the world their morbid hyper-acuteness of sensation so fatal to nervous health and to that equilibrium of sanity which belonged to Goethe, Victor Hugo, and all the Olympians; and *La Maison d'un Artiste* (1881) had shown their patient love for *bric-a-brac* and its reflex influence upon the mind; but the *Lettres de Jules Goncourt* (1885), and still more the *Journal des Goncourt* (6 vols. 1888–92), have disclosed their conception of fiction and their method of work so fully, that the latter may be accepted as the formal propaganda of a school which embraces many of the foremost novelists of France. See a fine study by Paul Bourget in his *Nouveaux Essais de Psychologie* (1885); and Belloc and Shedlock, *E. and J. de Goncourt* (2 vols. 1892).

Gondar, capital of Amhara in Abyssinia, is situated on a basaltic hill 23 miles N. of Lake Tzana (see ABYSSINIA). Gondar was formerly the residence of the emperor, and at one time had about 50,000 inhabitants; its population numbers at present barely 4000, though there are still some forty churches. The hill is crowned by the ruin of the old castle, built by Indian architects under Portuguese direction; burned by Theodore in 1867, it is now left to the bats and hyænas. The Mohammedan town (Islambed), at the foot of the hill, formerly noticeable for its clean streets and pretty houses, has been deserted in consequence of an edict commanding the baptism of the inhabitants; but the Falashas are permitted to keep their Jewish quarter. Part of the town was burned by the Dervishes in 1889. There are manufactures of fine leather and gold and silver filigree-work, church vessels, and musical instruments; and the priests are masters of penmanship, and prepare religious paintings, reading-desks, and praying-stools. Most of the young priests of Abyssinia are educated here. There is a considerable transit trade.

Gondo koro, a trading post in the country of the Bari negroes, on the Upper Nile, in about 4° 54′ N. lat. A Catholic mission founded here in 1853 was discontinued in 1858 owing to the bad climate and the hostility of the slave-traders. It is now deserted during the greater part of the year, but in December and January merchants arrive and establish an important ivory-market, which was formerly also a centre of the slave-trade. To put this down Baker established a strong military station here in 1871, and changed the name to Ismailia; but, before the abandonment by Egypt of its possessions in Central Africa, Gordon removed the station to Lado, 6 miles lower down the Nile.

Gondola (Ital.), a long narrow boat (averaging 30 feet by 4) used chiefly on the canals of Venice. The prow and stern taper to a point, and curve high out of the water. In the centre there may or may not be a curtained chamber for the occupants.

Venetian Gondola.

The boat is usually propelled by one man standing at the stern, by means of a large sweep very deftly and powerfully handled by the gondolier; or there may be another man at the bow. Immense sums were spent by the wealthy on the luxurious adornment of their gondolas, till in the 16th century sumptuary laws were passed, the consequence of which was that the ordinary gondola came to be of the plainest funereal black, with black cloth cushions and fittings—in Byron's phrase, 'just like a coffin clapp'd in a canoe.'

Gondomar, DIEGO SARMIENTO DE ACUÑA, MARQUIS DE, Spanish ambassador in England from 1613 to 1621. He acquired great influence over King James I., and plied him with all the arts of persuasion to induce him to bring the projected Spanish match, the marriage of Prince Charles with the Infanta, to a successful termination. The ruling motive of his policy was, however, the warmly cherished hope of being able eventually to convert the English nation to Roman Catholicism. See S. R. Gardiner, *Prince Charles and the Spanish Marriage* (1869).

Gonds, a Dravidian people, the most important of the non-Aryan or 'aboriginal' hill-races of the Central Provinces (q.v.) of India. They probably entered the country at an early period from the north, and gave their name to Gondwana, which comprised the greater part of the Central Provinces;

but it was only from the 16th century to the Mahratta invasion in 1741–81 that they ruled the central tableland. To-day they number about a million and a half, and, while the wilder tribes cling to the forest, the rest have made some advances in civilisation. Most of the upper classes are of mixed blood, and many of the race have embraced Hinduism; but, while they carry ceremonial refinements to the extremest limit, they secretly retain many of their old superstitions, with which they have even inoculated their Aryan co-religionists in the territory. The plebeian Gonds are of purer blood, and, as among the other hill-tribes, both sexes limit their necessary attire to a cloth wound about the waist, although the younger people often eke this out with earrings, bracelets, and necklaces. Each village worships the three or four deities it knows best, while admitting the existence of an indefinite number of others. Cholera and smallpox are worshipped everywhere, and the Gonds people the forest, the rivers, and every rock with evil spirits. The name Gondwana is still applied to the tract which they principally inhabit.

Gonfalon (Ital. *gonfalone*), or GONFANON, an ensign or standard (see FLAG), in virtue of bearing which the chief-magistrates in many of the Italian cities were known as *gonfaloniere* (see FLORENCE).

Gong, a Chinese instrument of percussion, made of a mixture of metals (78 to 80 parts of copper, and 22 to 20 parts of tin), and shaped into a basin-like form, flat and large, with a rim a few inches deep. The sound of the gong is produced by striking it, while hung by the rim, with a mallet, which puts the metal into an extraordinary state of vibration, and produces a loud piercing sound.

Gongora. LUIS DE GONGORA Y ARGOTE, Spanish lyric poet, was born at Cordova, 11th July 1561. After a course of study in law at the university of Salamanca, he settled down in his native city to cultivate the poetic talents of which he had already shown conspicuous proofs as a student. About 1614 he entered the church, and became a prebendary of the cathedral at Cordova, and eventually chaplain to Philip III. He died in his native city, 23d May 1627. Gongora's earlier writings—sonnets on a great variety of subjects, lyrical poems, odes, ballads, and songs for the guitar—are inspired with much true poetic feeling. His later works, consisting for the most part of longer poems, such as *Soledades* (or *Solitary Musings*), *Polifemo*, *Pyramo y Thisbe*, are executed in an entirely different and novel style, characterised, especially in respect of diction, by some of the same distinctive features as are found in Euphuism in England and Chiabrerism in Italy. This later style of Gongora, which his followers and imitators designated the *stilo culto*, is florid, pedantic, full of Latin inversions and mythological allusions, pompous, and mannered, and in many places very obscure. His works were never published during his lifetime. The first edition was printed by Vicuña in 1627, good but incomplete; another good one is that of Brussels (1659). See Churton's *Gongora* (2 vols. Lond. 1862).

Goniatites, a genus of fossil cephalopodous mollusca, belonging to the same family as the Ammonites. The genus is characterised by the structure of the septa, which are lobed, but without lateral denticulations, as in Ammonites; they consequently exhibit, in a section, a continuous undulating line. Some forms with slightly waved septa approach very near to the Nautilus. The siphonal portion is shorter than the sides, forming a sinus at the back, as in the Nautilus. The last chamber, the one tenanted by the animal, occupies a whole whorl, and has besides a considerable lateral expansion. The shells are small, seldom exceeding 6 inches in diameter. This genus is confined to the Palæozoic strata: nearly two hundred species have been described from the Devonian, Carboniferous, and Triassic systems.

Gonidia, an old term in lichenology for the green cells (algal constituents) of the thallus. See LICHENS.

Goniometer (Gr. *gonia*, 'an angle;' *metron*, 'a measure'), an instrument used for measuring solid angles, and hence indispensable to the crystallographer. There are two kinds in use, the *contact goniometer* of Carangeau (which is sufficiently accurate for many purposes, but cannot be used in the case of very small crystals), and the *reflecting goniometer* by Dr Wollaston. In skilful hands this instrument can measure the angles of crystals only the hundredth of an inch in size. Several elaborate modifications of this goniometer are now employed by crystallographers.

Gonorrhea (Gr. *gonos*, 'progeny or seed,' and *rheō*, 'I flow'), a name originally applied almost indiscriminately to all discharges from the genital passages in both sexes, but especially in the male. In the course of usage the term has been almost entirely restricted to the designation of one particular kind of discharge, which, from its connection with a contagious poison, was originally called, in strict nosological language, *G. virulenta*. This form of the disease is usually caused by the direct communication of sound persons with those already affected; and accordingly gonorrhea is one of the numerous penalties attending an indiscriminate and impure intercourse of the sexes (see SYPHILIS). Gonorrhea is a very acute and painful form of disease; it is liable, also, to leave its traces in the more chronic form of gleet, which may last for a considerable time. Often, moreover, it leaves some of the parts affected permanently damaged, and stricture, sterility, &c. may result. The only constitutional effect of any importance is a very intractable inflammation of joints, closely resembling rheumatic fever, which occasionally follows it. The name gonorrhea was formed on the erroneous supposition that the discharge consists of the spermatic fluid, whereas, the disease being an inflammation of the mucous membrane of some part of the generative organs, the discharge is the muco-purulent or purulent discharge from the diseased surface. Hence the name *Blennorrhagia* has been proposed for the ailment. The disease may reach its height in a period of from one to three weeks; it then usually subsides, and the various symptoms abate in severity. For gonorrheal ophthalmia, see EYE (DISEASES OF). Victims of gonorrhea and the allied disorders should be warned against consulting any but medical men of high standing and undoubted character.

Gonsalvo di Cordova (the name by which Gonzalo Hernandez y Aguilar is usually known), a celebrated Spanish warrior, was born at Montilla, near Cordova, 16th March 1453. He served with great distinction first in the war with the Moors of Granada, and afterwards in the Portuguese campaign. At the close of the final contest with Granada he concluded the negotiation with Boabdil (Abu Abdallah), king of the Moors, in such a masterly manner that the rulers of Spain bestowed upon him a pension and a large estate in the conquered territory. He was next sent to the assistance of Ferdinand II., king of Naples, against the French. In less than a year Gonsalvo, with his limited resources, had conquered the greater part of the kingdom of Naples, and obtained the appellation of 'El Gran Capitan.' In conjunction with King Ferdinand he succeeded in completely expelling the French from Italy; and in August 1498

he returned to Spain, having received as reward for his valuable services an estate in the Abruzzi, with the title of Duke of San Angelo. When the partition of the kingdom of Naples was determined upon by a compact entered into at Granada, 11th November 1500, Gonsalvo again set out for Italy with a body of 4300 men, but first took Zante and Cephalonia from the Turks, and restored them to the Venetians. He then landed in Sicily, occupied Naples and Calabria, and demanded from the French that, in compliance with the compact, they should yield up Capitanata and Basilicata. This demand being rejected, a war broke out between the two belligerent powers, which was waged with varied success. After the victory of Cerignola, in April 1503, Gonsalvo took possession of Calabria, the Abruzzi, Apulia, even the city of Naples itself, and then laid siege to Gaëta, but was forced to retreat before a superior force of the enemy. On the 29th December of the same year, however, he fell upon them unexpectedly near the Garigliano, and obtained a complete victory. The French army was almost annihilated; the fortress of Gaeta fell; and the possession of Naples was secured to the Spaniards. King Ferdinand of Spain bestowed the duchy of Sesa upon the conqueror, and appointed him viceroy of Naples, with unlimited authority. His good-fortune, however, made him many powerful enemies; and he was recalled to Spain and to neglect. He lived on his estates in Granada till his death, 2d December 1515.

Gontcharoff, Ivan Alexandrovitch (1813–91), Russian novelist, was born a merchant's son at Simbirsk, and for many years was in a government office at St Petersburg. *A Common Story* was translated in 1894; *The Oblomoff* is his masterpiece.

Gonzaga, a princely family which gave a line of dukes to Mantua and Montferrat. The sway of this race over Mantua extended over a period of three centuries, and many of its members were magnificent promoters and cultivators of arts, science, and literature. The Gonzagas gradually monopolised all the chief posts of command, both civil and military; in 1432 they were invested with the title and jurisdiction of hereditary marquises, and in 1530 with that of dukes or sovereigns of the state. After their elevation to ducal dignity they were the faithful champions of the imperial interests in their policy with other states. The House of Gonzaga and that of the Visconti Dukes of Milan were perpetually at war (see Mantua). The marquisate was granted to Giovanni Francesco in 1433. The tenth and last Duke of Mantua, Ferdinando Carlo, who had countenanced the French in the War of the Succession, was deprived by the Emperor Joseph I. of his states, and placed under the ban of the empire. He died in exile in 1708, leaving no issue. A branch of the family ruled Guastalla till 1746.

Gonzaga, Luigi, known as St Aloysius, was born in the castle of Castiglione, near Brescia, 9th March 1568, and was educated at Florence, Mantua, and Rome. Renouncing his marquisate of Castiglione in favour of his brother, he entered the Society of Jesus in 1585. At Rome during a visitation of the plague he gave himself up with wonderful self-devotion to the care of the sick; and, stricken by the malady, died 21st June 1591. He was beatified in 1621, and canonised in 1726. See the *Life of St Aloysius Gonzaga*, edited by E. H. Thompson (1867); the Italian Life by Cepari (trans. by Goldie, 1891); and Aubrey de Vere's *Essays* (1888).

Good, John Mason, physician and writer, was born May 25, 1764, at Epping in Essex, where his father was an Independent minister. He was apprenticed to a surgeon-apothecary at Gosport, next continued his medical studies in London, and commenced practice as a surgeon in Sudbury in 1784. Money difficulties drove him to London in 1793, where he combined medicine with the most miscellaneous literary activity. In 1820 he took his M.D. degree at Marischal College, Aberdeen, and died January 2, 1827. Good's writings embrace poems, translations of Job, the Song of Songs, and Lucretius, essays on prisons, medical technology, and the history of medicine. He collaborated with Dr Olinthus Gregory and Newton Bosworth in the *Pantologia, a New Cyclopædia, comprising a General Dictionary of Arts, Sciences, and General Literature*, in twelve volumes, which was completed in 1813. His ambitious poem, *The Book of Nature*, was published in 1826.

Goodall, Frederick, an English artist, the son of Edward Goodall (1795–1870), an engraver, who early encouraged his son's artistic talents, was born in London, September 17, 1822. He was only seventeen years of age when he exhibited his first picture at the Royal Academy, 'French Soldiers playing Cards in a Cabaret.' 'The Return from a Christening,' which received a prize of £50 from the British Institution, 'Tired Soldier' (1842), 'Village Festival' (1847), 'Hunt the Slipper' (1849), 'Raising the Maypole' (1851), and 'Cranmer at the Traitors' Gate' (1856) are amongst the best of his early pictures. A visit to Venice and Egypt in 1857–59 led him to turn his attention to Italian and oriental subjects, such as 'Reciting Tasso' (1859), 'Song of the Nubian Slave' (1864), 'Rising of the Nile' (1865), 'Mater Dolorosa' (1868), 'Sheep-washing near the Pyramids of Gizeh' (1876), 'Daughters of Laban' (1878), 'Return from Mecca' (1881), 'Flight into Egypt' (1885), and numerous others. Goodall was elected a Royal Academician in 1863.

Good-conduct Pay is an addition to ordinary pay, granted to privates, lance-corporals, and acting bombardiers of the British army. To earn one penny a day the soldier must have served two years without his name having appeared in the regimental defaulters' book, in which serious crimes are recorded. For a second penny six years' service is requisite, and the soldier must have held the first penny for two years without an entry in the regimental defaulters' book—called a 'term of good conduct.' A third penny can similarly be earned after twelve years' service, a fourth after eighteen, and others after periods of five years. Each penny carries with it a badge or Chevron (q.v.) to be worn on the left sleeve. A special rule enables a man who has served without an entry for 14 years continuously to obtain his fourth and succeeding badges and good-conduct pay two years sooner than he otherwise would do. One badge and the pay attached to it is forfeited for every entry in the regimental defaulters' book, but may be regained by a 'half-term of good conduct' (one year) for each badge lost. A soldier who deserts, or is sentenced by court-martial to penal servitude or to be discharged, or by a civil court to imprisonment exceeding six months, forfeits, as a result of the sentence, all his badges and good-conduct pay; and a court-martial may specially sentence him to this forfeiture for any offence. Sergeants and full corporals or bombardiers when reduced to the ranks are allotted the good-conduct pay and badges, less one, which their service would have entitled them to if they had not been promoted, though none is granted to them while non-commissioned officers. Sergeants of distinguished or meritorious service, however, are granted annuities, not over £20 each, receivable during active service, and also on retirement, together with a silver medal inscribed 'for meritorious service,' or 'for distinguished conduct in the

field.'—In the navy very similar rules govern the issue of good-conduct pay, but its amount is limited to threepence a day, and petty officers may hold it.

In the United States the pay of private soldiers increases from $13 to $18 per month according to length of service; and the pay of officers in active service, from chaplain to colonel, increases by 10 per cent. for every five years' service till the completion of twenty years' service.

Goodeniaceæ, an order of corollifloral dicotyledons, closely allied to Campanulaceæ and Lobeliaceæ. The 200 species, the great part herbs, are mostly natives of the Australian and South African regions. *Goodenia ovata* is a pretty yellow-flowered shrub of Australia. *Scævola Taccada* is a shrub from the pith of which the Malays make a kind of rice-paper. The young leaves are eaten as a salad.

Good Friday, the name applied by the Roman Catholic and Anglican Church to the Friday before Easter, sacred as commemorating the crucifixion of our Lord; *paraskeuē*, Holy Friday, or Friday in Holy Week, was its general appellation. This day was kept as a day of mourning, of rigid fast, and of special prayer from a very early period. It was one of the two paschal days celebrated by the Christian church, and in memory of the crucifixion was called by the Greeks *Pascha Staurösimon*, or the 'Pasch of the Cross.' In the Catholic Church the service of this day is very peculiar: instead of the ordinary mass, it consists of what is called the Mass of the Pre-sanctified, the sacred host not being consecrated on Good Friday, but reserved from the preceding day. Formerly all the faithful partook in silence of the eucharist, but at present communion is forbidden on Good Friday, except in the case of the celebrant and of sick persons. The priests and attendants are vested in black; the altar remains stripped of its ornaments, as on Holy Thursday; a wooden clapper is substituted for the bell at the elevation of the host; the priest recites a series of prayers for all classes, orders, and ranks in the church, and even for heretics, pagans, and Jews, though the ministers' genuflexion is omitted before this last petition, in detestation of the feigned obeisance with which the Jews mocked Christ. But the most striking part of the ceremonial of Good Friday is the so-called 'adoration of the cross,' or, as it was called in the Old English popular vocabulary, 'creeping to the cross.' The black covering is removed from a large crucifix which is placed before the altar, and the entire congregation, commencing with the celebrant priest and his ministers, approach, and upon their knees reverently kiss the figure of our crucified Lord. In the eyes of Protestants this ceremony appears to partake more strongly of the idolatrous character than any other in the Roman Catholic ritual; but Catholics earnestly repudiate all such construction of the ceremony (see IDOLATRY, IMAGE-WORSHIP). The very striking office of *Tenebræ* ('darkness') is held upon Good Friday, as well as on the preceding two days: it consists of the matins and lauds of the following day, and has this peculiarity, that by the close all the lights in the church have been gradually extinguished except one, which for a time (as a symbol of our Lord's death and burial) is hidden at the Epistle corner of the altar.

In the Anglican Church also Good Friday is celebrated with special solemnity: proper psalms are appointed, and one of the three special collects is a prayer for 'all Jews, Turks, heretics, and infidels.' In some ritualistic churches the *improperia*, or 'reproaches,' adopted from the Roman service, are sung; and Bach's Passion music is frequently heard. In England and Ireland Good Friday is by law a *dies non*, and all business is suspended; but this is not the case in Scotland or the United States. In Scotland the day until recently met with no peculiar attention, except from members of the Episcopal and Roman Catholic communions; but of late years there have been services in some Presbyterian churches in the larger towns. See also CROSS-BUNS, and CRAMP-RINGS.

Good Hope. See CAPE OF GOOD HOPE.

Goodrich, SAMUEL GRISWOLD, an American author, best known by his pen-name, PETER PARLEY, was born in Ridgefield, Connecticut, 19th August 1793, and edited in Boston an annual called *The Token* from 1828 to 1842, to which he contributed poems, tales, and essays, and in which the best of Hawthorne's 'Twice-told Tales' first appeared. He published some two hundred volumes, mostly for the young, and dealing with history, geography, travels, and natural history. Many of his books were reprinted, and became popular in Great Britain. He died 9th May 1860. See his *Recollections of a Lifetime* (2 vols. New York, 1857).

Goodsir, JOHN, anatomist, was born in 1814, at Anstruther in Fife, studied arts at St Andrews University, and was next apprenticed to a dentist in Edinburgh, attending the medical classes there the while. In 1839 he published a striking essay on the teeth, and next year became keeper of the Museum of the Royal College of Surgeons in Edinburgh, where he lectured on the diseases of bone and cartilage (1842–43). He also investigated the minute structure of the healthy tissues, and was one of the first observers who strongly insisted on the importance, throughout the animal textures, of the cell as a centre of nutrition. His important memoirs on Secreting Structures and on the Human Placenta, and many of his papers in comparative anatomy and natural history, are still of value. Of these a volume was issued in 1845. In 1844 Goodsir was appointed assistant to Dr Monro, professor of Anatomy in the university of Edinburgh, and two years later became his successor. Here he maintained a wide reputation as an anatomical teacher. Ill-health overtook him near the close of his life, and he died 6th March 1867. See the *Memoir* by Professor Turner (1868).

Good Templars, a temperance society founded in the United States in 1852 and introduced into England in 1868. Their organisation is largely modelled on that of the Freemasons, total abstinence principles being furthered by means of lodges, pass-words, grips, and insignia. See TEMPERANCE.

Good-will, when used as a legal term, has two meanings, which have been conveniently distinguished as personal and local good-will. Personal good-will is that interest which is sold along with a profession, and is transferable from one person to another by the recommendation of the seller, and his agreement not to compete with the buyer, as when a doctor or a dentist sells his practice. Local good-will is the saleable interest which attaches to a particular business at a particular place, or, as Lord Eldon defined it, 'the chance that the old customers will resort to the old place,' without the further advantage of personal stipulations with the seller, as in the sale of such a business as 'The Railway Hotel,' 'The Market Shop.' When an old business is transferred the possession of the premises and the old stock (which is necessary to the acquirement of the good-will) is usually regulated by special agreement, and what goes as good-will is the right to carry on the old business, to represent that it is the old business that is carried on, to use the trade name and the trade-mark, and to benefit by the covenants made by the previous owner for the protection of his business.

In a strict view there is no such thing as a transferable good will of so personal a business as a medical, legal, or other professional practice. In the sale of these there ought therefore always to be a stipulation that the seller shall not compete with the buyer by practising in the same locality, or that he shall retire from practice; and that the seller shall introduce and recommend the buyer to his connection as his qualified successor. At first such a covenant was sought to be set aside as invalid, on the ground that it tended to restrain the natural liberty of trade; but the courts have now firmly established that, if a definite radius of moderate length is fixed upon, it does not sensibly restrain trade, inasmuch as the person covenanting can go beyond those limits, and trade as much as he pleases. If the party breaks his covenant he is liable to an action for damages. See Charles E. Allan, *The Law relating to Good will* (1889).

Goodwin Sands, famous sandbanks stretching about 10 miles in a NE. and SW. direction at an average distance of 5½ miles from the east coast of Kent. Large level patches of sand are left dry when the tide recedes, and afford a firm foothold, so that cricket has often been played upon them. When covered the sands are shifting, and may be moved by the prevailing tide to such an extent as to considerably change the form of the shoal. The general outline, however, has been fairly constant, although the survey of 1885 by Staff-commander Tizard, R.N., has demonstrated a tendency to more important motion than usual. The shoal is divided into two principal parts, called the North Goodwin and the South Goodwin respectively, between which is the deep inlet named Trinity Bay, where three steamships have been peacefully anchored at one time. In 1841 it was proposed by W. Bush, C.E., and J. D. Paine, architect, to build a harbour of refuge on the Goodwin Sands by enclosing Trinity Bay with a solid wall of masonry, having a large iron lighthouse at the entrance. The North Goodwin is of irregular semicircular shape, with the curved boundary on its northern or outer edge. The North Sand Head light-vessel is moored a little to the eastward of its northern extreme, exhibits a white flash light, and is about 7 miles distant from Ramsgate. So far back as 1795 a lightship, showing three lights, was moored to the north-east of this shoal. The South Goodwin is in shape somewhat like a crab's claw with its lower part fully extended. The South Sand Head lightship lies off its south-western extremity, and exhibits a double-flash white light. On the western side rides the Gull Stream lightship, displaying a white revolving light. A fourth lightship, known as the East Goodwin, lies 1½ mile to the eastward of the sands, and exhibits a green revolving light. Passing ships not infrequently foul these lightships, notwithstanding the penalty of £50 and expenses to which they become liable. On 30th November 1878 no fewer than three unknown ships in succession ran into the East Goodwin lightship. All four of the lights are visible 10 miles in clear weather. Each vessel is painted red, has her name in bold letters on both sides, and is otherwise distinguished by the disposition of her mast or masts. In foggy weather a fog siren is sounded on the South Sand Head lightship, and gongs are beaten on board the other three. Should a ship be observed standing into danger, warning guns are fired without delay. The Goodwin Sands are also marked by nine buoys moored in well-defined positions around them, and distinguishable from one another by their various colours and shapes. One, the north-east Goodwin buoy, is a Courtenay's self-acting whistle buoy. This admirable system of lightships and buoys has robbed the Goodwins of much of their danger.

These sands have always been dangerous to vessels passing through the Straits of Dover. On the other hand, they serve as a breakwater to form a secure anchorage in the Downs (q.v.) when easterly or south-easterly winds are blowing. The Downs, though safe under these circumstances, become dangerous when the wind blows strongly off-shore, at which time ships are apt to drag their anchors, and to strand upon the perfidious Goodwins. As a rule, wrecks are soon swallowed up by the greedy sands. One ship, the *Ogle Castle*, of 1000 tons burden, entirely disappeared in an hour. In May 1841, however, the ship *Ellison* remained ashore on the North Goodwin for nineteen consecutive tides, and was got off only slightly damaged. The timbers of another wreck were exposed to view at intervals for forty years. Many celebrated wrecks have taken place here, the most terrible having been the loss of an entire fleet of thirteen men-of-war, during the 'great storm' on the night of the 26th of November 1703, on the Sands and neighbouring shore. In two of these, the *Mary* and the *Restoration*, every soul perished. Admiral Beaumont with 1200 officers and men were lost. Many poor wretches got on to the Goodwins when the tide was out, and were seen from the shore. Mr T. Powell, the then mayor of Deal, seized the custom-house boats, and paid five shillings for every man saved. Over two hundred were rescued who would certainly have been overwhelmed by the rising tide. In December 1805 here foundered the *Aurora*, a transport, when no fewer than three hundred persons perished; in December 1814 the *British Queen*, an Ostend packet, was lost with all hands; and in January 1857 the mail-steamer *Violet* was destroyed.

These dangerous sands are said to have once been a low fertile island called Lomea (*Infera Insula* of the Romans), belonging to Earl Godwin, where he lived and kept his fleets; but in 1014, and again in 1099, it was overwhelmed by a sudden inundation of the sea, which also did great damage in other parts of Europe. The tale is that at the period of the Conquest by William of Normandy these estates were taken from Earl Godwin's son, and bestowed upon the abbey of St Augustine at Canterbury. The abbot, having diverted the funds with which it should have been maintained to the building of Tenterden steeple, allowed the sea-wall to fall into a dilapidated condition; and so, in the year 1099, the waves rushed in, and overwhelmed the whole. Tenterden, it should be noted, is an inland place near the south-west frontier of Kent, 15 miles NNE. of Hastings. Thus 'Tenterden steeple was the cause of the Goodwin Sands;' so, at least, says one of the many legends connected with these remarkable shoals. But geology indicates a date long anterior to the catastrophe of the legend.

Difficulty is experienced in finding firm anchorage for the lightships; and all efforts to establish a lighthouse have been hitherto unsuccessful. In 1840 a beacon, having a refuge-gallery at its summit capable of containing forty people, was erected by Captain Bullock, R.N., which stood for some years, and another in 1847 on piles of iron screwed into the sand, on Dr Pott's method, but this was washed away two months afterwards. As soon as a vessel is known to have been driven upon the sands, signal rockets are thrown up and guns fired from the lightships, when one or more of the four lifeboats from Ramsgate, Deal, Walmer, or Kingsdown immediately launch to the rescue, followed usually by 'hovellers'' boats. These 'hovellers,' as the pilots and boatmen of the Cinque Ports are called, show, in seasons of tempest and danger, an intrepidity which is worthy

of all praise. See Gattie, *Memorials of the Goodwin Sands* (1889).

Goodwood, the seat of the Duke of Richmond, 3½ miles NE. of Chichester. An 18th-century building by Chambers and Wyatt, it has a notable collection of portraits; and its park is famous for its cedars and other trees, which in 1754 included 'thirty different kinds of oaks and 400 different American trees and shrubs' (Bishop Pocock's *Travels through England*, Camden Society, 1889). Here is the picturesque racecourse, where the famous Goodwood meeting is held at the end of July, at the close of the London season. It was established in 1802; but its importance (since 1825) was due to Lord George Bentinck's exertions.

Goodyear, CHARLES, an American inventor, was born 29th December 1800, at New Haven, Connecticut. He failed as an iron-manufacturer in 1830, but in 1834 turned his attention to india-rubber, the manufactured products of which had hitherto proved failures because of their liability to soften in the heat of summer. Amid poverty and ridicule, sometimes in prison for debt, he patiently pursued the experiments which, after he had obtained a fresh idea from his assistant Hayward's use of sulphur, ended, in 1844, in the issue of his patent for vulcanised rubber (see INDIA-RUBBER). This process he afterwards perfected, discovering new uses to which his product could be applied, until it required sixty patents to secure his inventions. He received medals at London (1851) and Paris (1855), as well as the cross of the Legion of Honour; although kept in continual litigation and consequent poverty by shameless infringements of his rights, he yet lived 'to see his material applied to nearly five hundred uses, and to give employment, in England, France, Germany, and the United States, to 60,000 persons' (Parton). He died at New York, July 1, 1860. See Pierce, *Trials of an Inventor* (New York, 1866); and Parton, *Famous Americans of Recent Times* (Boston, 1867).

Googe, BARNABY, poet, was born about 1540 at Alvingham, in Lincolnshire, studied both at Christ's College, Cambridge, and at New College, Oxford, then travelled on the Continent, joining on his return the household of his relative Sir William Cecil, and becoming one of the gentlemen-pensioners of Queen Elizabeth. He died in the month of February 1594. He was a friend of George Turberville, and resembled, without equalling, him in the manner of his translations and the metres of his poems. His best works are a series of eight eclogues and his *Cupido Conquered*, which it is not unlikely that Spenser may have seen. A collection of his Eclogues, Epitaphs, and Sonnets was published by Edward Arber in 1871.

Goole, a town and river-port in the West Riding of Yorkshire, is situated at the junction of the Ouse with the Don, 22 miles SSE. of York. The town has since 1829 grown rapidly, and now ranks amongst the chief ports of the kingdom. It possesses extensive docks, which are annually entered and cleared by some 4600 vessels of more than 1,100,000 tons burden. The annual value of the imports amounts to about 4¼ millions sterling, and that of the exports to more than 4¾ millions. Amongst the imports are shoddy for manufacturing purposes, oil, logwood, timber, champagne, farm-produce, and groceries. Coal, cloth, and machinery are amongst the chief exports. There are iron-foundries, alum, sugar, and cordage manufactories, ship and boat building yards, and establishments for sail-making and agricultural machine-making. Pop. (1851) 4722; (1881) 10,418; (1891) 15,413.

Goorkhas, or GURKHAS, since 1769 the dominant race in Nepal, claiming descent from Hindu immigrants, but now almost everywhere commingled with the original Mongolian stock. They fought fiercely and brilliantly in the war of 1814–15. Immediately afterwards three or four battalions were raised for the service of the British power in India. The Goorkhas, who are a short, thick-set race, are brave and faithful soldiers, fought in the Afghan and Sikh wars, and lent valuable aid to the British in the suppression of the Mutiny; and some ten regiments of Goorkhas recruited from Nepal and the borders, now form a most valuable element in our native Indian army. Those from the western districts are much more distinctively a fighting race than those from the eastern parts.

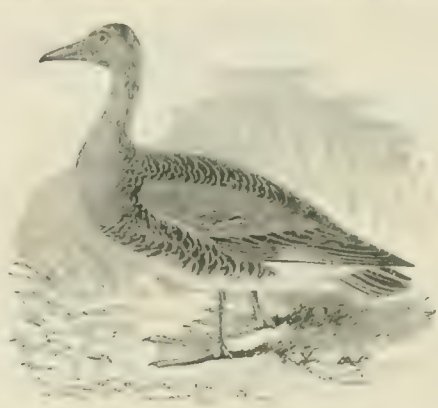
Goosander (*Mergus merganser*), a web-footed bird in the duck family (Anatidæ), in the same genus as the Mergansers, of which it is the largest British representative. The adult male, which measures 26 inches in length, has the head and upper part of the neck of a rich shining green, the feathers of the crown and back of the head elongated, the back black and gray, the wings black and white, the breast and belly of a delicate reddish-buff colour. The bill, legs, and feet are orange-red. The female, which is rather smaller, has the head reddish-brown, with a less decided tuft than the male, and much grayer plumage. The edges of the bill are saw-like above and below, being covered with numerous sharp tooth-like projections directed backwards. The goosander is a native of the Arctic regions, extending into the temperate parts of Europe, Asia, and America.

Goosander (*Mergus merganser*).

In the southern parts of Britain it is seen only in winter, and then only in severe weather, the females and young migrating southwards more frequently than the old males, and not unfrequently appearing in small flocks in the south of Scotland and north of England. In some of the estuaries and fresh-water lakes in the northern parts of Scotland it spends the whole year. It usually nests under a ledge of rock, in the hollow trunk of a tree, or under the shelter of the twisted roots, and lays, about the end of April, eight to thirteen creamy-white eggs. It feeds almost entirely on living fish, which its serrated bill and its power of diving admirably adapt it for catching. The flesh of the goosander is extremely rank and coarse.

Goose (*Anser*), a genus of web-footed birds belonging to the duck family (Anatidæ). The bill is rather high at the base and not longer than the head; the upper part of the beak is slightly hooked, and the lamellæ, characteristic of all the duck tribe, are short, tooth-like, and altogether adapted to

cropping the grass and other herbage on which the geese chiefly feed. The feet are short and completely webbed; the hind toe is present; and the legs are placed comparatively far forward, so that the movements on land are less awkward than those of most ducks. Geese swim little, and never dive. When migrating, or on other long flights, they usually fly in a double line, converging to form a more or less perfect wedge, led by a single gander. The genus is represented by over a dozen species occurring throughout the palæarctic and nearctic regions. Only one species is certainly known to nest in Britain—the Gray Lag-goose (*A. cinereus*)—from which our common domestic goose is believed to be descended. This species used to breed abundantly in the fen districts of England, but has become very rare since the drainage of these parts. It still breeds, though not commonly, in the northern counties of Scotland and in the Hebrides, and large flocks are seen in winter in some of the central counties of Ireland. The nest is placed among heather or on a ledge of rock, and is made of reeds, moss, or grasses. The eggs, usually five to six in number, are surrounded by down plucked by the female from her own breast. The length of the adult male is about 35 inches; of the female, 30 inches; the plumage is grayish-brown on the upper parts, bluish-gray on the wing-coverts, dull white with black markings on the under parts; the feet, legs, and bill are flesh-coloured, and the nail at the tip of the bill is white. This last characteristic is shared by a smaller species, the White-fronted or Laughing Goose (*A. albifrons*), and by it these two may be readily distinguished from the other two common species which have the nail black. The white-fronted goose arrives in Britain every winter in large flocks as soon as severe weather sets in on the Continent. The male measures 27 inches; the prevailing colour is brown. The Bean Goose (*A. segetum*) and the Pink-footed Goose (*A. brachyrhynchus*) are closely allied species,



Bean Goose (*Anas segetum*)

common in many parts of the country from autumn till late in spring. The bean goose is said to exhibit a fondness for newly-sown beans, among which it causes considerable havoc. Its plumage is darker than that of the preceding species; its length is 34 inches. It is readily domesticated. The smaller pink-footed goose has the legs and feet of a pink colour; the bill pink above, black at the base and edges; the nail, as in the bean goose, black.

A great rarity in Britain is the white North American Snow Goose (*Chen hyperboreus*), which is found all over North America, but breeds in the far north. The Canada Goose (*Bernicla canadensis*), found all over North America (where it is the commonest wild goose), is partially domesticated in Europe, where it breeds freely. Among the sea-geese the genus Bernicla, represented by our Barnacle Goose (q.v.) and Brent Goose (q.v.), must especially be noted. In other genera there are many interesting forms which can only be mentioned. The Egyptian or Nile Goose (*Alopochen ægyptiaca*), which is often seen figured on Egyptian monuments, was the 'fox-goose' or 'chenalopex' of the Greeks, so called perhaps on account of the barrows in which it breeds or the fox-like colour of part of its plumage. It is frequently kept in confinement, and finds its nearest relative in the Orinoco Goose (*Alopochen jubata*) of north-east South America. Notable also is the African Spur-winged Goose (Plectropterus), in which the corner of the wing bears a strong spur. Very unique, with sharply-clawed and only slightly webbed toes is the Semi-palmate Goose (*Anseranas semipalmatus*) of Australia, which in habit and anatomy suggests a crane. Also Australian and very peculiar is the sluggish and heavy, thick-billed Cape Barren Goose (*Cereopsis novæ hollandiæ*), rapidly becoming scarce (see CEREOPSIS). Finally this last form leads us to the yet more remote Cnemiornis, which formerly inhabited New Zealand, but having wholly lost the power of flight naturally became extinct.

Although the common goose has been long domesticated, and was probably among the very first of domesticated birds, the varieties do not differ widely from each other. *Emden Geese* are remarkable for their perfect whiteness, *Toulouse Geese* for their large size. As a domesticated bird the goose is of great value, both for the table and on account of its quills and fine soft feathers. The quills supplied all Europe with pens before steel pens were invented, and have not ceased to be in great demand. Geese must have free access to water, and when this is the case they are easily reared and rendered profitable. Two broods are sometimes produced in a season, ten or eleven in a brood, and the young geese are ready for the table three months after they have left the shell. They live, if permitted, to a great age. Willughby records an instance of one that reached the age of eighty years, and was killed at last for its mischievousness. Great flocks of geese are kept in some places in England, particularly in Lincolnshire, and regularly plucked five times a year for feathers and quills. Geese intended for the table are commonly shut up for a few weeks, and fattened before being killed. Great numbers are imported from Holland and Germany for the London market, and fattened in England in establishments entirely devoted to this purpose. Michaelmas is the great goose season. *Goose-hams* are an esteemed delicacy. The gizzards, heads, and legs of geese are also sold in sets, under the name of *giblets*, to be used for pies. The livers of geese have long been in request among epicures both ancient and modern. The *pâté de foie gras* of Strasburg is made from livers in a state of morbid enlargement, caused by keeping the geese in an apartment of very high temperature. See BARNACLE GOOSE, CEREOPSIS, DUCK, SWAN.

Gooseberry (*Grossularia*), a sub-genus of Ribes (see CURRANT), distinguished by a thorny stem, a more or less bell-shaped calyx and flowers on 1-3-flowered stalks. The common gooseberry (*Ribes Grossularia*) is a native of many parts of Europe and the north of Asia, growing wild in rocky situations and in thickets, particularly in mountainous districts; but it is a doubtful native of Britain, although now to be seen in hedges and thickets almost everywhere. There are three main

varieties, formerly regarded as distinct species: (1) *R. Grossularia*, now merely var. *pubescens*, in which the hairs are glandular and cover the berries; (2) var. *uva-crispa*, in which the hairs are non-glandular, and fall off the berries before ripening; (3) var. *reclinatum*, in which hairs are found only on the leaf-margins. The varieties produced by cultivation are very numerous, chiefly in England, where, and particularly in Lancashire, the greatest attention has been paid to the cultivation of this valuable fruit-shrub. In the south of Europe it is little known. It does not appear to have been known to the ancients. Its cultivation cannot be certainly referred to an earlier date than the 17th century, and was only in its infancy at the middle of the 18th, when the largest gooseberries produced in Lancashire scarcely weighed more than ½ oz., whereas prize gooseberries now sometimes reach 2 oz. Many well-known diversities of form, colour, and flavour, as well as of size, mark the different varieties. For the production of new varieties the gooseberry is propagated by seed; otherwise, generally by cuttings, which grow very freely. Any good garden soil suits the gooseberry. It is rather the better for a little shade, but suffers from much. The bushes are trained in various ways, but it is necessary to prune so that they may not be choked up with shoots; yet care ought to be taken to have an abundant supply of young wood, which produces the largest berries. Summer rather than winter pruning is now largely recommended. Besides its well-known wholesomeness and pleasantness, and its use for making an excellent preserve and jelly, the ripe fruit is used for making wine and vinegar. An effervescent gooseberry wine, which might well claim attention under its own name, is often fraudulently sold as champagne. The use of unripe gooseberries for tarts increases the value of this fruit-shrub. The gooseberry season is prolonged by training plants on north walls, and by covering the bushes with matting when the fruit is nearly ripe. Unripe gooseberries may be kept in jars or bottles, which are closely sealed while heated to expel air, and placed in a cool cellar, to be used for tarts in winter.

Various derivations have been given of the name gooseberry, but most probably the first syllable is a corruption of *groscille*, the French name of the fruit, from which also comes the Scotch *grozet* or *grozart*. Attempts to introduce the European gooseberry into North America have invariably failed, owing to the appearance, sooner or later, of mildew among the plants. Among the other species or varieties most worthy of notice are *R. oxyacanthoides*, extending across the upper North American continent from the Atlantic to the Pacific, and now largely grown for market in the middle states; *R. divaricatum* and *R. irriguum*, both of north-west America—all agreeable, though small and more or less acid; *R. gracile*, found in mountain-meadows from New York to Virginia, with blue or purplish berries of exquisite flavour; *R. aciculare*, a Siberian species, with sweet, well-flavoured yellowish or purplish smooth berries; all of which, and probably others, seem to deserve more attention than they have yet received from horticulturists.—The Snowy-flowered Gooseberry (*R. niveum*), a native of America, is remarkable for its beautiful white pendulous flowers. Its berries in size and colour resemble black currants, and make delicious tarts. *R. speciosum*, from the same region, is very ornamental.—*R. saxatile*, of Siberia, and other species, forming the sub-genus Botrycarpum, have a character intermediate between currants and gooseberries, being prickly shrubs, with their berries in racemes.—The so-called Cape or Peruvian Gooseberry is a Physalis (q.v.). For the Coromandel Gooseberry, see CARAMBOLA. —The GOOSEBERRY BUG is the Harvest Bug (q.v.).

Gooseberry Caterpillar, a name applied to the larvæ of two very different insects, both injurious to gooseberry and currant bushes. (1) The Magpie Moth (*Abraxas grossulariata*), appearing about midsummer, has usually a black head, yellow

The Magpie Moth (*Abraxas grossulariata*): *a*, caterpillar; *b*, chrysalis.

body, and white wings spotted with black. From eggs laid on the leaves of the above-mentioned bushes caterpillars hatch in September, feed for a brief space, and then hide themselves till May or June of the next year. The caterpillar is a 'looper,' drawing itself up into a peculiar curve when alarmed, and has a black head, creamy body with some stripes of reddish-orange along the side and elsewhere, and with a row of black spots along the middle line of the back. After a period of voracity, it spins a transparent cocoon and passes into a chrysalis, 'yellow at first, but afterwards shining black, with orange-coloured rings.' Care of the bushes, syringing with various washes, and gathering the torpid caterpillars are the usual means of prevention and remedy. (2) More destructive than the above is the larva of the Gooseberry Sawfly (*Nematus ribesii*), which plays havoc with the leaves of our bushes. The female sawfly appears about April and lays her eggs on the leaves. The grubs hatch in a week or less, and eat small round holes first in the leaf on which they are born, then all over the bush. The adult fly is a yellowish insect with transparent wings, and measures about a third of an inch in length. The larva is bluish-green,

Gooseberry Sawfly (*Nematus ribesii*): *a*, adult fly; *b*, natural size; *c*, larva; *d*, pupa.

with black head, feet, tail, and spots, with twenty feet, and a length of about three-fourths of an inch when full grown. At maturity they drop from the bushes, and bury themselves in the ground to undergo their metamorphoses. The grubs of late summer broods remain as such, but within cocoons, throughout winter, finishing their metamorphoses as the gooseberry bushes are becoming leafy in spring. Miss Ormerod recommends removing the surface soil in early spring from under the bushes, treatment with lime, picking off attacked leaves, drenching the bush with warm water not hot enough to hurt the leaves, dusting with flour of sulphur, &c. Dusting with

hellebore powder is dangerous to those who may eat the berries from which the poison has not been removed. In regard to both these practically important insects, consult Miss Ormerod's *Manual of Injurious Insects* (Lond. 1881).

Goose-fish, a common name in America for the Angler-fish (see ANGLER). The American Goose-fish (*Lophius americanus*) is one of the best known of the five species of Lophius, grows to a length of 4 to 5 feet, and weighs from 15 to 170 lb. It is dark brown above and dirty white below, is hideous in appearance (being also known as 'wide gab' and 'devil-fish'), and has a most voracious appetite, preying indifferently on all kinds of fish, and eating occasionally fowls, such as gulls and ducks. It is practically useless for any purpose.

Goosefoot. See CHENOPODIUM.

Goosegrass. See CLEAVERS.

Gopher, a name in use in some parts of America for various kinds of ground squirrel (see CHIPMUNK), for the Prairie Dog (q.v.), for the Pouched Rat (q.v.), and even for the land tortoise of the southern states.

Gopher Wood. The probable identity of the gopher wood of Scripture with the Cypress (q.v.) is affirmed on account of the qualities of the wood, and on account of the agreement of the radical consonants of the names.

Göppingen, a town of Württemburg, 26 miles by rail ESE. of Stuttgart, has a 16th-century castle, a mineral spring (alkaline carbonic acid), and carries on manufactures of woollen cloth, paper, toys, &c. Pop. 14,337.

Gopura. See INDIA, p. 109.

Gorakhpur, capital of a district in the North-west Provinces of India, on the Rapti, 430 miles NW. of Calcutta, with an active trade in grain and timber. Pop. (1891) 64,980.—The flat, well-watered district of Gorakhpur has an area of 4598 sq. m., three-fifths of which is cultivated, and a fourth under forest. Pop. (1891) 2,994,057, nine-tenths Hindus.

Goramy, or GOURAMI (*Osphromenus olfax*), a fish of the family Anabasidæ or Labyrinthi-branchidæ, a native of the Eastern Archipelago, highly esteemed for the table, and introduced on that account into India, Mauritius, Cayenne, and the French West India Islands. Its form is deep in proportion to its length, the head small, and terminating in a rather sharp short snout, the mouth small, the tail rounded, the dorsal and anal fins having numerous rather short spines, the first ray of the ventral fins extending into a very long filament; it attains the size of a large turbot. It is sometimes kept in large jars by the Dutch residents in Java, and fed on water-plants. It was introduced into Mauritius about the middle of the 18th century, and soon spread from the tanks in which it was at first kept into the streams, multiplying abundantly. The goramy is interesting also on other accounts. It is one of the nest-building fishes, and at the breeding season forms its nest by entangling the stems and leaves of aquatic grasses. Both the male and female watch the nest for a month or more with careful vigilance, and violently drive away every other fish which approaches, till the spawn is hatched, afterwards affording a similar parental protection to the young fry.

Gordian Knot. The traditional origin of this famous knot was as follows. The Phrygians, seeking a king, were informed by the oracle at Delphi that they were to choose the first person they met riding on an ox-cart towards the temple of Zeus. That person was Gordius, a poor peasant, who accordingly was elected king. He afterwards dedicated his car and yoke to Zeus, in the acropolis of Gordium (a city named after himself), and tied the knot of the yoke in so skilful a manner that an oracle declared whoever should unloose it would be ruler of all Asia. When Alexander the Great came to Gordium, he cut the knot in two with his sword and applied the prophecy to himself.

Gordianus, the name of three Roman emperors, father, son, and grandson.—The first, MARCUS ANTONIUS GORDIANUS, was descended by the father's side from the famous family of the Gracchi. After being ædile, in which capacity he celebrated gladiatorial sports with great magnificence, he twice filled the office of consul. On the conclusion of his second term of office he was appointed proconsul of Africa. He was a man of modest and gentle manners, great liberality, and refined literary taste. The tyranny and injustice of the Emperor Maximinus at length excited a rebellion in Africa, the authors of which proclaimed Gordianus emperor, although he was then (238) in his eightieth year. At the same time his son was conjoined with him in the exercise of imperial authority. The younger Gordianus, however, was defeated and slain in battle by Capellianus, viceroy of Mauritania, before Carthage, whereupon his father put an end to his own existence, having been emperor for little more than a month.—MARCUS ANTONIUS GORDIANUS, grandson of the preceding, was raised to the dignity of Cæsar along with Pupienus and Balbinus, who were also elected emperors in opposition to Maximinus; and, in the same year (238), after the three last named had all fallen by the hands of their own soldiers, Gordianus was elevated by the Prætorian bands to the rank of Augustus. Assisted by his father-in-law, Misitheus, a man distinguished for his wisdom, virtue, and courage, whom he made prefect of the Prætorians, Gordianus marched in 242 into Asia, against the Persians, who under Shahpûr (Sapor) had taken possession of Mesopotamia and had advanced into Syria. Antioch, which was threatened by them, was relieved by Gordianus; the Persians were driven back beyond the Euphrates; and Gordianus was just about to march into their country when Misitheus died. Philip the Arabian, who succeeded Misitheus, stirred up the soldiery to assassinate the emperor (244).

Gordius. See HAIR-EEL.

Gordon, THE FAMILY OF. This great Scottish historical house takes its origin and name from the lands of Gordon in Berwickshire. The first traces of it are found in the beginning of the 13th century, when Gordons witnessed charters by the Earls of Dunbar and March, and granted lands and pasturages to the monks of Kelso. In 1305 Sir Adam of Gordon held under King Edward I. of England the office of joint-justiciar of Lothian, and sat at Westminster as one of the representatives of Scotland. He was among the last to join the banner of Bruce, who rewarded his adherence by a grant of the northern lordship of Strathbogie. The grant failed of effect at the time; but it was renewed by King David II. in 1357, and by King Robert II. in 1376. Under this last renewal Sir John of Gordon, the great-grandson of Sir Adam, entered into possession, and so transferred the chief seat of the family from the Merse and Teviotdale to the banks of the Dee, the Deveron, and the Spey. The direct male line came to an end in his son Sir Adam, who fell at Homildon in 1402, leaving an only daughter to inherit his lands, but transmitting his name through two illegitimate brothers—John of Gordon of Scurdarg, and Thomas of Gordon of Ruthven—to a wide circle of the gentry of Mar, Buchan, and Strathbogie, who, calling themselves

'Gordons,' styled the descendants of their niece 'Seton-Gordons.'

Dukes of Gordon.—Elizabeth of Gordon, the heiress of Sir Adam, married before 1408 Alexander of Seton (son of Sir William of Seton), who before 1437 was created Lord of Gordon. Their son Alexander, who took the name of Gordon, was made Earl of Huntly in 1449, and Lord of Badenoch a few years afterwards. He acquired by marriage the baronies of Cluny, Aboyne, and Glenmuick in Aberdeenshire; and had grants from the crown of the lordship of Badenoch and other lands in Inverness-shire and Moray. He died in 1470, and was succeeded by his second son George, who had married Annabella, daughter of King James I., and who added to his territories the lands of Schivas in Aberdeenshire, and Boyne, Enzie, and Netherdale in Banffshire. He was chancellor of Scotland from 1498 to 1501, and, dying soon afterwards, was succeeded by his son Alexander, the third earl, who acquired Strathaven (or Strathdoun) in Banffshire, and the Brae of Lochaber in Inverness-shire. He commanded the left wing of the Scottish army at Flodden. Dying in 1524, he was succeeded by his grandson George, the fourth earl, who acquired the earldom of Moray, held the offices of lieutenant of the north and chancellor of the realm, and was reputed the wisest, wealthiest, and most powerful subject in Scotland. The crown, counselled to clip his wings lest he should attempt, like the Douglases in the previous age, to overawe the throne, stripped him of the earldom of Moray, and, rushing into revolt, he fell (or died of apoplexy) at Corrichie in 1562. Sentence of forfeiture was pronounced upon his corpse, but was rescinded in 1565, and his son George succeeded as fifth earl. He died in 1576. His son George, the sixth earl, was conspicuous as the head of the Roman Catholics in Scotland. He defeated at Glenlivet a royal force sent against him under the Earl of Argyll in 1594, but, submitting to the king, obtained an easy pardon, and was made Marquis of Huntly in 1599. He died in 1636. His son George, the second marquis, espoused the royal cause in the great civil war of his time. 'You may take my head from my shoulders,' he said, in answer to tempting offers from the Covenanters, 'but not my heart from my king.' When he resided in Aberdeen in 1639 he was attended daily by twenty-four gentlemen, of whom three were barons, while eight gentlemen guarded his mansion by night. He was beheaded at Edinburgh in 1649. His son Lewis, the third marquis, was restored by King Charles II. in 1651, but died in 1653. His son George, the fourth marquis, was created Duke of Gordon in 1684. He held the castle of Edinburgh for King James VII. at the Revolution; and, dying in 1716, was succeeded by his son Alexander, the second duke, who died in 1728. He lived, Boswell says, 'in sequestered magnificence, corresponding with the grand-dukes of Tuscany,' with whom he believed that he could count kindred. His son Cosmo George, the third duke, died in 1752, leaving three sons. The youngest, Lord George Gordon (q.v.), led the Protestant mob which sacked London in 1780; the eldest, Alexander, who became fourth duke, was the author of the well-known song, 'Cauld Kail in Aberdeen.' His wife, the sprightly Jane Maxwell, daughter of Sir William Maxwell of Monreith, was even more noted for her beauty than her wit, and was known as the 'beautiful Duchess of Gordon' (died 1812). The fourth duke died in 1827, and was succeeded by his son George, the fifth duke, on whose death, without issue, in 1836, the title of Duke of Gordon (being limited to the heirs-male of the body of the first duke) became extinct, the title of Earl of Huntly fell into abeyance, and the title of Marquis of Huntly was adjudged to the Earl of Aboyne, as heir-male of the body of the first marquis. The estates went to the duke's nephew, Charles, fifth Duke of Richmond and Lennox, grandson of the fourth Duke of Gordon. Elizabeth, Duchess of Gordon (1774–1864), widow of the fifth duke, long survived her husband, and was a woman of noble character and eminent piety (see her *Life and Letters*, by A. M. Stuart, 1866). The title of Duke of Gordon was revived in 1876 in the person of the sixth Duke of Richmond.

Marquises of Huntly.—Lord John Gordon, second son of the first Marquis of Huntly, was made Viscount of Melgund and Lord Aboyne in 1627. Three years afterwards he was burned to death in the tower of Frendraught. In 1632 his elder brother George was made Viscount of Aboyne, which title, on his succession to the Marquisate of Huntly in 1636, devolved on his son Lord James, who distinguished himself on the king's side during the wars of the Covenant, and died, it is said, of a broken heart, a few days after the execution of King Charles I. in 1649. His younger brother, Lord Charles Gordon, was made Earl of Aboyne in 1660; and his great-great-grandson, George, who had been a favourite at the court of Marie Antoinette, succeeded as fifth Earl of Aboyne in 1794, on the death of his father, and as ninth Marquis of Huntly in 1836, on the death of the fifth Duke of Gordon. In 1853 the ninth marquis was succeeded by his eldest son Charles, tenth marquis, who died in 1863, and the marquisate of Huntly and earldom of Aboyne fell to his eldest son Charles, eleventh marquis.

Earls of Sutherland.—About the year 1512 Adam Gordon of Aboyne, second son of the second Earl of Huntly, married Elizabeth, the heiress of Sutherland, and was progenitor of the Gordon Earls of Sutherland, who bore the surname of Gordon till the beginning of the 18th century, when they exchanged it for that of Sutherland, which had been borne by the earlier earls.

Lochinvar and Kenmure.—William of Gordon (1306-29), the second son of Sir Adam of Gordon, was the progenitor of the knightly family of Lochinvar, which in 1633 was raised to the peerage by the titles of Lord of Lochinvar and Viscount of Kenmure. William, the sixth viscount—the 'Kenmure's on and awa'' of Jacobite song—was beheaded in 1716 for his share in the rising of the previous year. The peerage, then forfeited, was restored in 1824, but has been in abeyance since the death of Adam, the ninth viscount, in 1847.

Earls of Aberdeen.—According to old tradition this house descends from one of the illegitimate brothers of Sir Adam of Gordon, who was slain at Homildon in 1402. Its first authentic member was Patrick Gordon of Methlic, who died on the banks of the Ythan in 1445. In 1642 its chief, Sir John Gordon of Haddo, was created a baronet of Nova Scotia. He was beheaded at Edinburgh in 1644, bequeathing the name of 'Haddo's Hole' to one of the aisles of St Giles' Church, which had been his prison. His son, Sir George Gordon of Haddo, became a Lord of Session in 1680, Lord President in 1681, and Lord Chancellor in the following year. He was raised to the peerage in 1682, by the titles of Earl of Aberdeen, Viscount of Formartine, Lord Haddo, Methlic, Tarves, and Kellie. He died in 1720 with the character of being 'a solid statesman, a fine orator, speaking slow but strong.' Some of these lineaments, it has been thought, reappeared, with his love of letters, in his great-great-grandson, the fourth Earl of Aberdeen (q.v.). Among other members of the house of Gordon not mentioned above were Colonel John Gordon, one of the assassins of Wallenstein; Gordon Pasha; and, through his mother, Lord Byron.

See Poolbeers. There is a MS. *Historie Chronologique de l'Origine et Progrez des Gordons Ecossois* (1545), by an Italian monk, Ferretus; a MS. *Genealogie of Gordons Earles of Huntlie and Gordons com in Scotia*, by Gordon of Straloch (died 1661); and histories of the house by William Gordon (1727) and C. A. Gordon (1754). See the more valuable *Genealogical and Historical Memoirs of the Earls of Sutherland* which has much on the Gordons, by Sir Robert Gordon of Gordonstoun (written 1630, published 1813, with continuation).

Gordon, Adam Lindsay, the first of Australian poets, was born at Fayal in the Azores in 1833, the son of a retired army captain. At twenty he sailed to Adelaide to push his fortune, and tried in turns, but without success, sheep-farming, 'over landing,' and cattle driving in South Australia, emerging to light in Melbourne as the best gentleman steeplechase rider in the colony. His broken circumstances and religious hopelessness deepened the natural gloom of his temperament, and at length he threw up the struggle, and blew out his brains at Brighton, a marine suburb of Melbourne, 24th June 1870. He had published in 1867 *Sea spray and Smoke drift*, a very unequal volume, yet containing a few admirable lyrics reflecting closely the sombre colour of his life and the passionate despair that at last drove him to the refuge of death. His *Ashtaroth, a Dramatic Lyric* (1867), was an ambitious attempt at a task for which his powers were inadequate, only relieved from absolute failure by the beauty of the lyrics with which it is interspersed. His last volume, *Bush Ballads and Galloping Rhymes*, appeared, it is said, on the very day of his unhappy death, with a dedication to Major Whyte-Melville. The opening poem, 'The Sick Stock-rider,' is a marvellously vivid transcript from the bush-life he knew, steeped with the irresistible pathos of reality. 'How we beat the Favourite' is said to be the most popular poem in Australia, and certainly it is the best ballad of the turf in the English tongue, unequalled in its kind for fire and speed.

See A. P. Martin's article in *Temple Bar* for 1884 (vol. lxx.), Marcus Clarke's introduction to the complete edition of Gordon's poems, and D. B. W. Sladen's *Australian Poets* (1888).

Gordon, Charles George ('Gordon Pasha'), was born at Woolwich, 28th January 1833, fourth son of General Gordon, Royal Artillery, by his wife Elizabeth Enderby, and descended from the Gordons of Park, a cadet branch of the House of Huntly. From school at Taunton he passed in 1847 to the Military Academy, Woolwich; in 1852 entered the Royal Engineers; and saw his first active service in the trenches before Sebastopol, where he served from January 1855 to the end of the siege, being once slightly wounded. After the fall of the south side Gordon proceeded to Kinburn, returned again to Sebastopol, and was employed in the demolition of the docks and destruction of the forts; and he was subsequently engaged in surveying the new frontier between Turkey and Russia in Europe and Asia. In 1860 he went to China and took part in the capture of Peking and the destruction of the famous Summer Palace near that city. In 1863 he was appointed to the command of a Chinese force officered by Europeans and Americans, and during that and the following year was engaged almost incessantly against the Taiping rebels in the rich provinces of Cheh-kiang and Chiang-sû. In two campaigns he fought thirty-three actions and took numerous walled towns, crushing the formidable rebellion which had so long wasted the fairest provinces of China. This feat of arms achieved in the space of eighteen months, and at a cost of only £200,000, placed the young major of engineers in the foremost rank of the soldiers of his day. Returning from China in 1865, 'as poor as when he had entered it,' he was appointed to the ordinary engineer duties at Gravesend, where he remained for six years, devoting the greater part of his spare moments to relieving the want and misery of the poor, visiting the sick, teaching, feeding, and clothing the many waifs and strays among the destitute boys of the town, and providing employment for them on board ship. In 1872 he quitted Gravesend for Bulgaria, where he remained as commissioner on the Danube for nearly two years.

At the close of 1873 he accepted employment under Ismail, Khedive of Egypt, and, proceeding to the Soudan, took up the work which Sir Samuel Baker had begun two years earlier—that of opening up the vast regions of the equatorial Nile, and the lakes which recent exploration had discovered. In these distant and unhealthy regions he remained for three years, overcoming by extraordinary energy and resolution all difficulties of nature, hostile man and climate. A chain of posts was established along the Nile; steamers were brought from Egypt in sections, put together above the last rapid, and the navigation of Lake Albert Nyanza successfully accomplished. Underlying all this labour there was in Gordon's mind a purpose beyond gain or exploration. It was the abolition of the slave-trade which heretofore had been the one great object of Soudanese commerce. Discovering that his efforts to suppress this trade must remain unsuccessful unless his power extended to the vast plain countries lying west of the Nile basin—Kordofan and Dar-Fûr—Gordon returned to Egypt and England in 1876.

Going out again in January 1877, he was appointed by the Khedive sole governor of the entire Soudan, with unlimited powers over a region that stretched from the second cataract of the Nile to the Great Lakes, and from the Red Sea to the head-waters of the streams that fall into Lake Tchad. During the next three years he traversed in all directions this vast territory. Now he was settling a frontier dispute with the Abyssinian feudatories in the east; now swooping down with scanty escorts upon some slave raider or rebellious chieftain in western Dar-Fûr. For months together he seemed to live on the back of his camel. Neither the numbers of his enemies nor the fiercest sun of terrible deserts could check his energy. His presence, multiplied by incessant toil into twenty times the reality, awed the wild tribes into obedience, and for the first time in its history the Soudan seemed to feel that law and justice were united with government. Early in 1880 all this ceased. Gordon resigned his command. A great change was coming in Lower Egypt, and it was evident that under the new system which was being inaugurated at Cairo there could be no place for such a master. A short visit to India, continued on to the old scene of his first famous enterprise in China, filled up the greater portion of 1880; but the close of the year found Gordon in Ireland intent upon relieving the almost chronic unhappiness of that island. Struck with the terrible scenes of poverty which he witnessed in the south and west of the island, he propounded a scheme of land-law improvement, which, although then met with ridicule or silence, has since been largely made the basis of legislation; but these views did not tend to make their holder acceptable in the eyes of authority, and, to escape the necessity of accepting some insignificant routine appointment at home, Gordon volunteered to take another officer's duty in the Mauritius, where for another year he remained unnoticed and unthought of.

From Mauritius Gordon proceeded to the Cape

in colonial employment, and finally returned to England in the close of 1882. Almost the whole of the following year was spent by him in Palestine in unbroken quiet and reflection. Early in 1884 he was asked by the British government to proceed once more to the Soudan, where the events which had taken place in Egypt since he quitted it four years before had given rise to a long catalogue of catastrophe. The Moslem populations had risen in revolt, defeating the armies of Egypt and isolating her garrisons. To remove these garrisons from the Soudan was the primary object of Gordon's mission; that accomplished, he was to proclaim the separation of the country from Egyptian rule. But all this was changed by the hard logic of facts. A month after Gordon reached Khartoum that place was invested by the troops of the Mahdi, the leader of the Soudan revolt. Then began what may truly be called the supremely heroic period of Gordon's life. The world seemed to recognise that a great man was in the throes of a great peril. In an age when merit is rarely found unobtrusive, and when genius is apt to exhibit its light on the house-top, Gordon, whose whole life had been one endeavour to depreciate his own merit and to deny himself the glory of his actions, became at once the centre of perhaps the widest attention given in our time to one man. After the siege of Khartoum had lasted five months a relief expedition was organised in England. In September the advance up the Nile began. Early in November the troops entered the Soudan at the Second Cataract, the greater portion of the expedition moving in boats built in England for the passage of the upper cataracts, many of which had never been navigated by any craft. After two months of very arduous labour the advance, crossing the desert from Korti, and finding at the latter place some of Gordon's steamers, arrived in the end of January 1885 in the neighbourhood of Khartoum. It was too late. The place had been taken by the Mahdi two days earlier. Gordon had fallen. One thing, however, was gained by the toil and blood of this expedition. It was the journal kept by Gordon during the latter half of the siege. From this journal he stands before us—as in no other way could he have been revealed to us—a wonderful instance of courage, faith, resolution, and humility; a man from whose life and death we gather that, amid all the change of science and system, the mould in which the true hero is cast remains the same.

See Andrew Wilson's *Ever Victorious Army* (1868); Birkbeck Hill's *Gordon in Central Africa* (1881); Gordon's own *Reflections in Palestine* (1884), *Last Journals* (1885), and *Letters to his Sister* (1888); and the Lives of him by Hake (*The Story of Chinese Gordon*, 2 vols. 1884–85), Arch. Forbes (1884), by his brother, Sir Henry Gordon (1886), Sir W. F. Butler (1889), D. Boulger (1896), and the books on the Egyptian Soudan by Ohrwalder (trans. 1892) and Slatin Pasha (trans. 1896).

Gordon, Lord George, was born in London, 26th December 1751, the third son of the third Duke of Gordon. From Eton he entered the navy, and rose to be lieutenant, but quitted the service during the American war, after a dispute with the Admiralty. Elected in 1774 M.P. for the pocket borough of Ludgershall, Wiltshire, he presently attacked both sides with such freedom as to give rise to the saying that there were 'three parties in parliament—the ministry, the opposition, and Lord George Gordon.' Still he displayed considerable talent in debate, and no deficiency of wit or argument. A bill having, in 1778, passed the legislature for the relief of Roman Catholics from certain penalties and disabilities (see Catholic Emancipation), the Protestant Association of London was, among other societies, formed for the purpose of procuring its repeal, and in November 1779 Lord George was elected its president. On 2d June 1780 he headed a vast and excited mob of 50,000 persons, who, decked with blue cockades, marched in procession from St George's Fields to the House of Commons to present a petition for the repeal of the measure. Dreadful riots ensued in the metropolis, lasting five days, in the course of which many Catholic chapels and private dwelling-houses, Newgate prison, and the mansion of the chief-justice, Lord Mansfield, were destroyed. The magistrates feared to read the Riot Act, but at length on the 7th, when thirty-six fires were blazing at once, the troops were called out by the king, and everywhere drove the rioters before them, 210 being killed, 248 wounded, and 135 arrested, of whom 21 were afterwards executed. Property to the amount of £180,000 had been destroyed in the riots, a vivid description of which is given in Dickens's *Barnaby Rudge*. Lord George himself was tried for high-treason; but Erskine's defence got him off on the ground of absence of treasonable design. His subsequent conduct seemed that of a person of unsound mind. Having, in 1786, refused to come forward as a witness in a court of law, he was excommunicated by the Archbishop of Canterbury for contempt. In 1787 he was convicted, on two official informations, for a pamphlet reflecting on the laws and criminal justice of the country, and for publishing a libel on Marie Antoinette and the French ambassador in London. To evade sentence he retired to Holland, but was sent back to England, and apprehended at Birmingham. He died in Newgate of fever, 1st November 1793, having latterly become a proselyte to Judaism. There is a vindication of him by Dr Robert Watson (1795).

Gordon, Sir John Watson, Scottish portrait-painter, son of Captain Watson of the royal navy, was born at Edinburgh in 1788. His training in art was got in the studios of his uncle, George Watson, and Sir Henry Raeburn. At first he essayed imaginative subjects, but on Raeburn's death in 1823 he stepped into his place as the first portrait-painter of Scotland. Three years later he took the surname of Gordon; in 1850 he was elected president of the Royal Scottish Academy and knighted, and in 1851 he became a London Royal Academician. Gordon was as national in his art as it is possible for a portrait-painter to be; and nearly every man of note in Scotland, besides not a few in England, sat to him for their portraits. Among his best-known works may be mentioned 'Sir Walter Scott,' 'Dr Chalmers,' 'Earl of Dalhousie,' 'Sir Alexander Hope,' 'Lord President Hope,' 'Sir John Shaw Lefevre,' and 'the Provost of Peterhead.' The last picture gained the gold medal at the French Exhibition of 1855. Gordon was not a distinguished colourist, grays and quiet hues being predominant in his pictures. He died at Edinburgh, 1st June 1864.

Gordon, Lucie, Lady Duff, a clever writer, was the only child of John Austin, the jurist, and of Sarah Taylor, his wife, and was born in London, 24th June 1821. In 1826 she went with her parents to Germany, whence, after two years' stay, she returned, speaking German like her native language. At Boulogne in 1834 she met Heine, an acquaintance renewed with tender pathos twenty years later, when Heine was dying at Paris. In 1840 she became the wife of Sir Alexander Duff Gordon. In 1842 she gave to the world the first of her long series of translations from the German, Niebuhr's *Gods and Heroes of Greece*. This was followed by the *Amber Witch*, begun 1843; the *French in Algiers*, published 1845; and Feuerbach's *Remarkable Criminal Trials*, 1846. In 1849, in conjunction with her husband, she translated Ranke's *House of*

Brandenburg. In 1850 appeared her translation of Wailly's *Stella and Vanessa*; in 1853 she translated Comtesse d'Arbouville's *Village Doctor*, and, together with her husband, Ranke's *Ferdinand and Maximilian*. In the midst of her busy life alternating between translation work and the choicest society, her health gave way, and she was advised to try the climate of the Cape of Good Hope. Thence, 1861–62, were penned her genial and vivacious *Letters from the Cape*. After her return to England in 1862 she the same year visited Egypt for the sake of her health. She returned to England, June 1863, but was forced again to retreat to Egypt the same year. She died at Cairo on 14th July 1869, and was buried in the cemetery there. Her *Letters from Egypt* (1863) and *Last Letters from Egypt* (1875), observant and bright and cheerful, form perhaps her best contribution to literature. See Janet Ross, *Three Generations of Englishwomen* (1889).

Gordon, Patrick, soldier of fortune, was born at Easter Auchleuchries, on the coast of Aberdeenshire, 31st March 1635. Brought up by his mother as a Catholic, at sixteen he sailed from Aberdeen to Danzig, and entered the Jesuit college of Braunsberg. His restless temper could not long endure the stillness and austerity of that retreat, and, making his escape from it in 1653, he led for some time an unsettled life, until in 1655 he enlisted under the flag of Sweden, then at war with Poland. During the six years that he took part in the struggle between these two powers he was repeatedly made prisoner, and as often took service with his captors, until again retaken. He had risen to the rank of captain-lieutenant, when he resolved to try his fortune next with the czar, and in 1661 joined the Muscovite standard. Here his services in disciplining the Russian soldiers gained him rapid promotion—lieutenant-colonel in 1662, and colonel in 1665. Hearing that the death of his elder brother had made him 'goodman of Auchleuchries,' he wished to return to Scotland; but there was no escape from the Russian service. The czar, however, sent him on a mission to England in 1666. On his return he fell into disgrace; but during 1670–76 he was engaged in subduing the Cossacks in the Ukraine, in 1677 in defending Tschigirin against the Turks and the Tartars. His gallant performance of that duty procured him the rank of major-general. In 1683 he was made lieutenant-general; in 1685 obtained leave to visit England and Scotland. James II. wished him to enter the English service; but it was in vain that he petitioned for leave to quit Russia. In 1688 he was made general, and now began his intimacy with the Czar Peter, who, in the following year, owed to Gordon's zeal and courage his signal triumph over the conspirators against his throne and life. In 1698 he crushed the revolt of the Strelitzes during the czar's absence from Russia. On 29th November 1699 he died at Moscow. See Dr Joseph Robertson's edition of *Passages from the Diary of General Patrick Gordon* (Spalding Club, 1859).

Gordon Bennett, Mount, a mountain seen in Africa by Mr Stanley in 1875. It lies south of Albert Nyanza, a little north of the equator and east of 30° E. long. It is a truncated cone, probably an extinct crater, and rises 14,000 or 15,000 feet in height. It is sometimes covered with snow. See Ruwenzori.

Gordonia, a genus of Ternstrœmiaceæ. *G. Lasianthus*, the Loblolly Bay, which covers considerable tracts of swampy coast in the Gulf of Mexico, is a handsome tree (50 to 60 feet), with evergreen leaves, and large white fragrant flowers. The bark is used in tanning.

Gore, Mrs Catherine Grace, a clever and prolific English novelist, daughter of Mr Moody, wine-merchant, was born at East Retford, Nottinghamshire, in 1799. In 1823 she was married to Captain Charles Arthur Gore, with whom she resided for many years on the Continent, supporting her family by her literary labours. These were varied and voluminous to an extraordinary degree, amounting in all to more than seventy works. She died at Lynwood, Hants, January 29, 1861. Her first published work was *Theresa Marchmont* (1823). Some of her early novels, as the *Lettre de Cachet*, and the *Reign of Terror* (1827), were vivid descriptions of the French Revolution; but her greatest successes were her novels of English fashionable life, conspicuous among which were *Cecil, or the Adventures of a Coxcomb* (1841), and *Ormington* (1842). *The Ambassador's Wife*, *The Banker's Wife*, &c. She also wrote *The Rose Fancier's Manual* (1838). Mrs Gore's books are clever. She had seen much of the world both at home and abroad, and was never at a loss for characters or incidents. The chief feature of her novels is the lively caustic pictures of fashionable and high society, but they are wanting in genuine feeling and simplicity.

Gorée, a small island in French Senegal, lying immediately south of Cape Verd, is almost entirely covered by the town of Gorée, an unhealthy place of (1885) 2200 inhabitants. Its commercial importance is rapidly being transferred to the port of Dakar, which lies over against it on the mainland.

Gorey, a municipal borough and market-town of County Wexford, 59 miles S. of Dublin by rail, and 3 miles inland from St George's Channel. Pop. (1851) 2973; (1891) 2213.

Görgei, Arthur, commander-in-chief of the Hungarian forces during the revolt of 1849, was born at Toporcz, in the county of Zips, 5th February 1818. On the outbreak of the revolt in 1848, Görgei at once offered his services to the Hungarian independent government, and first distinguished himself by compelling Jellachich's Croatian reserve of 10,000 men to capitulate to him at Ozora, on 7th October. After this exploit he was given a command against Windischgrätz on the western frontier. But, driven back by the Austrian general to Raab by 26th December, and learning that Budapest had fallen and the government had fled to Debreczin, Görgei made a wide detour through the mountains to the north of the capital, and joined his troops to the army in the neighbourhood of Debreczin. Of this force Görgei was made commander-in-chief in the end of March 1849. Then, advancing westwards to the relief of Komorn, which still held out against the Austrians, he decisively routed the enemy in a succession of battles between April 2 and April 10. On April 22 he effected the relief of the beleaguered city, and four days later routed the Austrians so thoroughly at Uj-Szöny that they were compelled to evacuate the country. Meanwhile a new Austrian army was being equipped, and the Russians were invading the country from the north and north-east. At this critical period Görgei wasted valuable time in the siege of Ofen (Buda). After offering an obstinate but unavailing resistance to the Austrians in several battles near Komorn, Görgei was again compelled to retreat eastwards; but at Waitzen he encountered the Russians. Still retreating, by way of Tokay, he reached in the beginning of August Grosswardein, where he again suffered defeat from Paskevitch, the Russian general. On 11th August he was nominated dictator in Kossuth's stead at Arad, and two days later surrendered his army of 24,000 men, the last of the Hungarian forces in the

field, unconditionally, to the Russian commander Rüdiger, at Világos, near Arad. Görgei himself was imprisoned for some time at Klagenfurt, in Carinthia, but eventually set at liberty. His countrymen (including Kossuth) accused him of treachery, a charge to which he replied in *Mein Leben und Wirken in Ungarn in 1848 und 1849* (Leip. 1852). With Kossuth and the civil government he failed all along to act in cordial sympathy and harmony, and he is also said to have shown personal jealousy of the other Hungarian generals. He returned to Hungary in 1868, and in 1884 was presented with an address by 260 of his old companions in arms.

Gorges, Sir Ferdinando, styled 'the father of colonisation in America,' was born about 1565 at Ashton, in Somersetshire. He founded two Plymouth companies (1606–20 and 1620-35) for acquiring and planting lands in New England, and in 1639 received from the king a charter constituting him proprietor of Maine. He adhered to the king in the Civil War, and died some time in 1647. His son neglected the province, which finally placed itself under the jurisdiction of Massachusetts, to which colony Sir Ferdinando's grandson sold his rights in 1677 for £1250.

Gorgias, a celebrated Greek rhetorician and sophist, of the time of Socrates, was born at Leontini, in Sicily, and came to Athens as ambassador from his native city in 427 B.C. He subsequently settled in Greece, and, becoming famous as a teacher of eloquence, travelled from place to place, acquiring wealth as well as fame. He died at Larissa about 380, more than a hundred years old. He seems to have drawn the extremest consequences of the sophistic negativism; teaching that nothing is, and if it were, it would be unknowable, and if there were such a thing as knowledge, it would be uncommunicable (see Sophists). Plato's Dialogue *Gorgias* is written against him. Of a large work by him on Nature nothing remains. Two works attributed to him are extant, the *Apology of Palamedes*, and the *Encomium on Helena*, but their genuineness is disputed. The best edition is by Blass (Leip. 1871).

Gorgo, or Gorgon, according to Homer, a frightful female monster inhabiting the infernal regions. Hesiod mentions three Gorgones—Stheno, Euryale, and Medusa, of whom the last named is the chief inheritor of the characteristic attributes of the single Homeric Gorgon. Their habitation was on the brink of the Western Ocean, in the neighbourhood of Night and the Hesperides; but Herodotus and other later writers place it in Libya. They were generally represented as winged virgins with brazen claws and enormous teeth, having on their heads serpents in place of hair, and two serpents round their bodies by way of girdle. According to later legends, Medusa was originally a very beautiful maiden, and the only one of three sisters who was mortal. Having become a mother by Neptune in one of Minerva's temples, that virgin goddess changed her hair into serpents, which gave her so fearful an appearance that whoever looked on her was turned into stone. She was slain by Perseus, and her head placed in the shield of Minerva.

Gorgonia, a genus of corals of the Alcyonarian type, in which the colony of polypes forms a branched but flattened growth, supported by an internal axis of horn (*cornein*) originally derived from the bases of polypes. The genus, which includes over a score of widely distributed species, is nearly allied to the black coral (*Plexaura antipathes*) of the Red Sea and Indian Ocean, from the black horny axis of which ornaments are often made; and to the sea-fan (*Rhipidogorgia flabellum*), the much branched fan-like skeleton of

Sea-fan.

which is often brought home as a curiosity from the West Indies.

Gorgonzola, a village (pop. 4000) 12 miles NE. of Milan, with a fine church, silk manufactures, and trade in a special kind of cheese.

Gorham, George Cornelius (1787–1857), vicar of Brampford Speke, in North Devon, and hero of the 'Gorham case' (1848–50), which arose when Dr Phillpotts, Bishop of Exeter, refused to institute him on a presentation by the Lord Chancellor. The bishop found him to be of unsound doctrine as to the efficacy of the sacrament of baptism; inasmuch as he held that spiritual regeneration is not given or conferred in that sacrament, and in particular, that infants are not made therein 'members of Christ and the children of God,' as the catechism and formularies of the church declare them to be. The case was brought before the Arches Court of Canterbury, which decided (1849) that baptismal regeneration is the doctrine of the Church of England, and that the appeal must be dismissed with costs. From this decision Gorham appealed to the judicial committee of Privy-council. That court found that differences of opinion on various points left open were always thought consistent with subscription to the articles, and that opinions in no important particular to be distinguished from Gorham's had been maintained without censure by many eminent prelates and divines: the court therefore decided that the judgment of the Arches Court should be reversed, and Gorham was, after some further litigation, instituted to Brampford Speke. During the two years that the suit was pending the theological question was discussed with acrimony in sermons and pamphlets.

Gorhambury. See Bacon (Francis).

Gorilla (*Troglodytes Gorilla*), a great African ape, generally referred by naturalists to the same genus with the chimpanzee, although Professor Isidore Geoffroy St-Hilaire has attempted to establish for it a separate genus. It has received the name by which it is now known in consequence of its being supposed to be the same animal which is mentioned in the *Periplus* of Hanno the Carthaginian navigator, who visited the tropical parts of the west coast of Africa about the year 350 B.C., although it is by no means certain that the gorilla of Hanno is not the chimpanzee, or perhaps a species of baboon. Vague accounts of apes of great size, of which very wonderful stories were told,

were from time to time brought from Western Africa; but it was not till 1847 that the gorilla became really known to naturalists, when a skull was sent to Professor Wyman of Boston by Dr Wilson, an American missionary on the Gaboon River. Since that time not only have skeletons and skins been obtained in sufficient number for scientific examination, but information has also been procured concerning the habits of the animal in his native haunts. The accounts of the gorilla given in Du Chaillu's *Explorations and Adventures in Equatorial Africa* (Lond. 1861) soon came to be regarded by the highest scientific authorities, and particularly by Owen, as in the main trustworthy, notwithstanding all the doubt that was cast over that traveller's narrative of his adventures; and they are in accordance with all that has been learnt from other sources, and with the inferences to be deduced from the dentition and osteology of the animal.

The gorilla differs from the chimpanzee in its greater size; the height of an adult male in an erect posture being commonly about 5 feet 6 inches or 5 feet 8 inches, although there is reason to think that it sometimes exceeds 6 feet. The general aspect of the creature may be gathered from the accompanying figure. The skin is very black;

Gorilla (*Troglodytes Gorilla*).

the hairy covering of the back is thicker than on the belly; its colour varies in individual and on different parts of the body from reddish-brown to black.

The skeleton is very powerful and massive, and differs from the human skeleton in the following (among other) points. The skull is extremely prognathous, the supra-orbital ridges are enormously developed; there is a great crest between the frontals and parietal bones which joins the occiput crest. The canine teeth are very large, particularly in the male. The cervical vertebræ have very long spinous processes. The ribs increase progressively in their span, the chest cavity being thus more or less conical in form. The arm bones are much longer than in man, while the leg bones are shorter.

The muscular anatomy shows also certain marked differences from man, as does also the brain. The gorilla cannot be regarded as nearer to man than the chimpanzee and orang. There are a number of varieties of the gorilla, but apparently only one species, which is confined to the forests of West Africa between 2° N. and 5° S. lat., and 6° and 16° E. long. It is principally a vegetable feeder, though like most apes it also preys upon small mammals, birds, and their eggs.

Hand (*a*) and foot (*b*) of Gorilla.

The gorilla wanders about in families, consisting of one male and female and their young; most of the time is spent upon the ground, though the animal is a skilful climber. It is not so ferocious a creature as has been supposed, and when molested generally avoids an encounter; but if driven into a corner it will defend itself, and its enormous strength renders it a dangerous enemy. On such occasions it will advance to the attack, beating its breast with its fists and giving forth a furious roar. The gorilla has not been hitherto tamed, and, in an adult state at least, seems very incapable of it. In 1876 a live gorilla was brought to Berlin, the first authentic instance of the introduction of the animal into Europe; and in 1887 a young gorilla was exhibited at the Zoological Gardens in the Regent's Park. The name given to this animal in its native country is *N'gina*, or *Ingena*. On the Loango coast it is called *N'pungu*. For the skeleton, see ANTHROPOID APES, and the books there cited.

Gorkum (Dutch *Gorinchem*), a fortified town of South Holland, on the Merwede, 22 miles ESE. of Rotterdam, possesses an arsenal, some manufactures, and a miscellaneous trade. Pop. 12,300.

Görlitz, a town of Prussian Silesia, is situated on a declivity on the left bank of the Neisse, 49 miles W. of Liegnitz. One of its old mural towers, the Kaisertrutz, is now the guard-house and armoury. Among the beautiful Gothic churches the most interesting is that of St Peter and St Paul, built 1423-97, with five naves. Outside the town is the Kreuzkapelle, an imitation of the Holy Sepulchre at Jerusalem, built 1481-89. A railway viaduct, upwards of 2720 feet in length and 118 feet high, here crosses the valley of the Neisse. Görlitz has manufactures of cloth, which is its staple, cotton, linen, and fictile wares, with iron-foundries and machine-shops. Here Jacob Boehme spent most of his life and died. Pop. (1843) 15,200; (1890) 62,135, mostly Protestants. Görlitz was taken and held alternately by the Swedes and the Imperialists during the Thirty Years' War.

Görres, JAKOB JOSEPH VON, a distinguished German author, was born at Coblenz, 25th January 1776. In common with most of the ardent youth of the time, Görres threw himself eagerly into the movement of the French Revolution; and a journal established by him, *Das Rothe Blatt*, advanced the most extreme opinions of the time. In 1799 he went to Paris as the chief of a deputation to negotiate the annexation of the Rhine-land to the French Republic, but in Paris became convinced of Napoleon's despotism. On his return to Germany he settled down as a lecturer on physics in his native town, and devoted himself exclusively to literature for several years. In 1807 he published the first part of his well-known collection of German *Volksbücher;* and in 1810 his work on Asiatic mythology. From these studies, however, he was aroused to the hope of liberation

from French tyranny by the reverses of the French arms in the Russian expedition. Appealing to the national sentiment of his countrymen in the *Rheinischer Merkur*, he became, in truth, the literary centre of the national movement. After the re-establishment of German independence Görres denounced the encroachments of domestic absolutism with the same energy, until, having drawn upon himself the displeasure of the Prussian government, he was obliged to flee to France, and afterwards to Switzerland. In 1827 he accepted the professorship of the History of Literature in the university just founded at Munich by the liberal King Louis of Bavaria. His later years were devoted to literature, and to the controversies as to mixed marriages and Hermesianism (see HERMES). He was the founder of the Catholic journal, *Die Historisch-Politischen Blatter*. His chief work was his *Christliche Mystik* (1842; new ed. 1879). He died 29th January 1848. An edition of his works (9 vols.) appeared between 1854 and 1874. See the Life by Sepp (1876).

Gortschakoff, PRINCE ALEXANDER MICHAELOVITCH, Russian statesman, was born at St Petersburg, 16th July 1798, being the son of Prince Michael, a distinguished officer. He was educated at the celebrated Lyceum of Tzarskoe-Selo, and acquired experience in diplomacy under Nesselrode. Ambassador at Vienna (1854–56), he displayed great judgment and ability during the Crimean war, and it was chiefly through his influence that Russia agreed to the treaty of Paris. After this event Prince Gortschakoff succeeded Nesselrode as minister of foreign affairs. When France became hostile to Austria on the Italian question, he cultivated the friendship of the former. Desirous of restoring the prestige of Russia in European affairs, he addressed a circular dispatch to the Powers in 1860 in favour of the principle of nationalities in the Two Sicilies. He also favoured the French expedition of 1861 to Syria on behalf of the oppressed Christians, but he declined to associate himself with France and Great Britain in their unfriendly attitude towards the United States after the outbreak of the civil war. Touching the Polish insurrection of 1863, he repudiated foreign dictation, and asserted the right of Russia to settle her internal affairs in accordance with her own interests and the integrity of the empire. By this step he acquired great popularity at home and respect abroad, and he was appointed chancellor of the empire in July 1863. From this time until the ascendancy of Bismarck he was the most powerful minister in Europe.

He remained neutral during the struggle between Prussia and Austria; and, owing to a definite understanding between the Russian and Prussian chancellors, the neutrality of Austria was secured in the great Franco-Prussian war of 1870. Gortschakoff further availed himself of this war to counteract the injury done to Russian influence by the treaty of Paris. At the London Conference in January 1871 he procured the revision of the treaty, and the formation of another putting an end to the neutralisation of the Black Sea. For this service the emperor conferred upon him the dignity of Serene Highness. In 1873–74 he manifested a desire to preserve friendly relations with England in regard to central Asia, but this was scarcely consistent with his aggressive policy. In the Servian war of 1878 Gortschakoff took up an indecisive attitude; and after the conclusion of the Turko-Russian war, the repudiation of the treaty of San Stefano, and the signing of the treaty of Berlin his influence began to wane. At the Berlin Congress Bismarck and Beaconsfield had paid more attention to Schouvaloff than to the chancellor. Gortschakoff altogether ceased to be the first factor in European politics before Alexander II. was assassinated, and long before he was superseded by M. de Giers as minister for foreign affairs in March 1882. Gortschakoff's sphere of action was European, not local; he ignored too much Russian developments and Russian aspirations, took no active interest in the serious financial and industrial problems affecting his country, or in the growth of Nihilism, and he even failed to bear his part in the abolition of serfdom. After his retirement he left Russia for Baden-Baden, where he died on 1st March 1883. Gortschakoff was a man of considerable culture and a friend of the liberal arts. His diplomatic circulars were remarkable for their excellent diction, their wit, and their resistless logic. The name is also Englished by *Gortchakoff* and *Gorchakov*. See Klaczko's *Two Chancellors* (Eng. trans. 1876).

Gortschakoff, PRINCE MICHAEL, cousin of the above, was born in 1795, and served against the French in 1812–14 and against the Turks in 1828–29. In the war of the Polish revolution of 1831 he greatly distinguished himself, and was made general of artillery. He was appointed military governor of Warsaw in 1846, and took part in the invasion of Hungary in 1849. On the outbreak of the Crimean war he twice commanded the Russian army despatched to the Danubian Principalities, on the second occasion leading the retreating Russian forces into Bessarabia after the raising of the siege of Silistria. In 1855 he was appointed commander-in-chief in the Crimea and southern Russia. He was defeated on the Tchernaya, but recovered his laurels by his gallant defence of Sebastopol, and by his skilful retreat to the North Fort after the blowing up of the fortress. Alexander II. appointed him governor of Poland in 1856, and he was engaged in carrying out the conciliatory policy of the czar when his death occurred on May 30, 1861.

Gory Dew, a dark-red slimy film sometimes seen on damp walls and in shady places. Its appearance on the whitewashed walls of damp cellars, &c. is apt to occasion alarm from its resemblance to blood. It is one of the lowest forms of vegetable life, an alga of the group Palmellaceæ, and allied to the plant to which the phenomenon of Red Snow (q.v.) is due. Its botanical name is *Porphyridium cruentum* (*Palmella cruenta*). See PALMELLACEÆ, and ALGÆ.

Görz, capital of the Austrian crown-land of Görz-Gradisca, in the Küstenland, is charmingly situated in a fruitful plain, near the Isonzo, 35 miles NNW. of Trieste by rail. Shut in by mountains on all sides except the south, it enjoys an almost Italian climate, and has of late years acquired some fame as a health-resort. Among its principal buildings are the old castle of the former Counts of Görz and the former Jesuit college, both now used as barracks; the cathedral, with a beautiful sacristy; and the prince-bishop's and several other palaces. The surrounding plain is covered with vineyards, and industries are the cultivation and export of fruit and wine, whilst Görz's specialty has long been the printing of Hebrew books for the East. There are dyeworks, and important manufactures of flour, sugar, cotton, silks, rosoglio, paper, leather, soap, and matches. In a Franciscan cloister close by are the graves of Charles X. of France (q.v.), the Duc d'Angoulême and his wife, and the Comte de Chambord. Pop. (1869) 16,659; (1890) 21,825. See Schatzmayer, *Der Kurort Görz* (1886). The Austrian Illyrian Küstenland ('Coastland') includes the principality of Görz-Gradisca, the margraviate of Istria, with the Quarnero Islands, and Trieste and its territory. Its boundaries are the Adriatic on the south, and

on the remaining sides Venice, Carinthia, Carniola, and Croatia. Area, 3075 sq. m.; pop. (1880) 647,943; (1890) 695,394.

Goschen, GEORGE JOACHIM, English statesman, son of a London merchant of German extraction, was born in London, August 10, 1831, and was educated at Rugby and Oriel. He is LL.D., D.C.L., F.R.S., and P.C. In 1863 he wrote on exchange, and entered parliament as a Liberal for the City of London. When Lord Russell, after Palmerston's death, reorganised the Liberal ministry, he appointed Goschen Vice-president of the Board of Trade, November 1865. In the following January the latter entered the cabinet in consequence of his appointment as chancellor of the Duchy of Lancaster. When Gladstone became prime minister in 1868, Goschen took office as President of the Poor-law Board, but three years later became the head of the Admiralty, which post he retained until the fall of the Gladstone ministry in 1874. Goschen's next public work was the regulation, in conjunction with Joubert, of the Egyptian finances (1876). Then in 1878 he represented Great Britain at the international monetary conference held at Paris, and, two years afterwards, as ambassador extraordinary to the Porte, enforced on Turkey the fulfilment towards Greece of the treaty of Berlin. He strenuously opposed Home Rule; in 1887–92 was Unionist Chancellor of the Exchequer, and in 1888 converted part of the National Debt. In 1895–1900, as First Lord of the Admiralty, he made provision for increasing the navy. He has published works on finance (*Foreign Exchanges*, 16th ed. 1894), education, &c., and has been Lord Rector of Aberdeen and Edinburgh Universities. He sat for London, 1863–80; Ripon, 1880–85; East Edinburgh, 1885–86; and St George's, Hanover Square, 1887–1900, when he retired from public life. His grandfather was the famous Leipzig bookseller, Georg Joachim Goschen (1752–1828).

Goshawk (lit., 'goose-hawk') (*Astur*), a genus in the family Falconidæ, nearly related to the sparrow-hawks (Accipiter), and like the latter distinguished from the falcons proper by not having a toothed or notched bill. The British species (*A. palumbarius*) is now only a visitor, and a rare one. It is common in the forests of northern and central Europe, and ranges as far east as Japan, and as far south as Morocco and Egypt. It is a rapacious bird, following small mammals and game-birds in swift, persistent, and rapidly altered flight. The prevalent colour of the plumage is ashy brown; the size of the females, which are decidedly the larger, is about two feet. The nest is large, built of sticks, and placed in a tree. The eggs (four) are bluish-gray in colour, and laid in April or May. The goshawk used to breed in Britain, and though termed 'ignoble' was employed in Falconry (q.v.) for hunting ground-game, on which it naturally preys.

Goshawk (*Astur palumbarius*).

The goshawk of the northern United States (*A. atricapillus*) is larger and handsomer, but otherwise very like the European species. Audubon describes its meteor-like flight, the power of steering afforded by the long tail, its vigilant industrious rapacity, and the characteristic erectness of its attitude when perched or engaged with its prey. A stray specimen, said to have been shot in Perthshire, is preserved in the Edinburgh Museum. The Australian Goshawk (*A. novæ hollandiæ*), sometimes called a white eagle, is remarkable in being 'apparently a permanent albino.'

Goshen, that part of ancient Egypt which Pharaoh presented to the kindred of Joseph when they came to sojourn in that country, appears to have lain between the eastern delta of the Nile and the Isthmus of Suez, as far south as the modern Ismailia. The district is generally supposed to have lain round about the Egyptian Kesem (Goshen is *Gesem* in the Septuagint), a name preserved in the classical Phacusa (Pa-Kesem), now Fakoos, about 45 miles S. of Damietta. But in 1885–87 M. Naville tried to prove that Goshen is represented by Saft-el-Henna, 6 miles E. of Zagazig, in the Wady Tumilât. See the *Fourth Memoir of the Egypt Exploration Fund* (1888). The LAND OF GOSHEN was the name given to a part of the Barolong country in Bechuanaland, South Africa, which became in 1884 the seat of a mushroom Boer republic, founded by the marauders who had supported Moshette, the rival of Montsioa in his contest for the headship of the Barolongs. It was, along with the rest of Bechuanaland, declared to be under British protection in September 1885.

Goslar, an ancient town of Hanover, situated on the north slope of the Harz Mountains, 27 miles SE. of Hildesheim. At one time a free imperial city, and the residence of the emperors, it has several noteworthy old buildings, as the tower called the 'Zwinger,' with walls 23 feet thick; the Late Romanesque church Neuwerk, of the 12th century, and the Frankenberger church (1108, restored 1880), both with ancient frescoes; the emperor's house, built in 1050 by Henry III., the dwelling-house of the emperors till the middle of the 13th century, the meeting-place of more than a score of imperial diets, restored in 1867–80, and adorned with frescoes by Wislicenus; the town-house, built in 1136–84; and the Kaiserworth, an old building containing statues of eight emperors. To the south of the town is the Rammelsberg, a mountain formerly very rich in silver, gold, copper, lead, sulphur, and green vitriol (sulphate of iron). The mines have been worked since 968, and are still in operation. Goslar was founded by Henry I. in 920. About 1350 it joined the Hanseatic League. Its ancient prosperity began to depart from it in the middle of the 16th century; and it suffered severely from the Swedes in the Thirty Years' War. In 1802 it ceased to be a free imperial town and fell to Prussia, to whom it again returned in 1866, after having in the meantime belonged to Westphalia (from 1807) and Hanover (from 1816). Here were born Henry IV. and Marshal Saxe. The Wordsworths were here in 1798. Pop. (1875) 9838; (1895) 18,966. See works by Mithoff (1874) and Wolfstieg (1885).

Gospellers, a word used with three different designations. (1) A term applied by the Roman Catholics to those Reformers who taught the people the words of Scripture in their own vulgar tongue, as Wyclif and his followers.—(2) A class of Antinomians, about the period of the Reformation, who drew 'strange inferences' from the doctrine

of predestination.—(3) The priest who reads the Gospel in the communion service of the Church of England, standing on the north side of the altar.

Gospels. The word *euaggelion*, which in classical Greek originally meant 'the reward for good news' (*Odyssey*, xiv. 152; comp. 2 Sam. iv. 10, LXX.), but afterwards simply 'good news' (Plutarch, Lucian, Appian), has from Anglo-Saxon times been rendered by the word *Gospel* (Godspell—i.e. story of God [Christ]). In the New Testament it is always used in the singular, and means 'the good news of the kingdom' as proclaimed by Christ and his apostles. Perhaps, however, in Mark i. 1 there is some trace of the technical sense, as denoting a written narrative of the life and utterances of Jesus, which it had fully acquired by the end of the 2d century (Justin Martyr, *Apol. I.* 66: 'the memoirs of the apostles . . . which are called gospels'). The gradual rise of the historical portion of the New Testament (belonging for the most part to a later period than the Epistles, which are the earliest extant documents of Christianity) has already been briefly traced in the article BIBLE (Vol. II. p. 124), where also the fact of the fixation of the four-fold gospel canon before the close of the 2d century has been stated; see also separate articles on MATTHEW, MARK, LUKE, and JOHN. Here it is enough to say that, since the canon was ecclesiastically settled, it has been the unvarying belief of the church in all its branches that these four gospels are to be received as clothed with apostolic authority—Matthew and John as written by apostles, Mark and Luke as written by companions of apostles.

Of the four, that of John is distinguished by peculiarities which give it a unique place among the New Testament writings, and will most conveniently be treated in the separate article. The first three, on the other hand, have very much in common; in fact, they present such a similarity in matter and form that they readily admit of being brought under one and the same 'combined view' or 'synopsis,' from which circumstance they have since the time of Griesbach (who coined the phrase) been commonly designated the 'synoptical' gospels (see the *Harmonies*, such as Tischendorf's *Synopsis Evangelica*). The resemblance is both in substance and in language. (1) They give the same general outline of the life of Jesus, and to a large extent select the same incidents for detailed treatment. Thus, they relate, on the whole, the same miracles, and preserve the same discourses. They are silent also on the same points; two, for example, give the woe pronounced upon Chorazin and Bethsaida, but no one of the three has anything precise to say about the occasion that called it forth. Various attempts have been made to represent in tabular and graphic form the amount of material coincidence between the synoptics; but it is probably impossible to do so with absolute exactness. The following estimate, however, the result of a recent somewhat careful examination, may be taken as approximately representing the facts. Of a total of 1071 verses, Matthew has 387 in common with Mark and Luke, 130 in common with Mark, 184 in common with Luke, and 370 peculiar to himself. Of Mark's 662 verses, 406 are common to all three synoptists, 145 common to Mark and Matthew, 60 common to Mark and Luke, and 51 (on a liberal estimate) peculiar to himself. Luke out of 1151 verses shares 390 with Matthew and Mark, 176 with Matthew, 41 with Mark, and has 544 peculiar to himself. (2) They often agree in a remarkable manner in the order in which they give the events they relate, even where the events themselves are only loosely connected; thus, in Matt. ix., Mark ii., and Luke v., the miraculous healing of the paralytic, Matthew's call and feast, the discourse on fasting, follow one another; in two gospels the last-mentioned discourse is immediately followed by the incident in the cornfield, which again, in all three, is followed by the healing of the withered hand. In Matthew and Mark the death of the Baptist is introduced at the same point and in the same way, but out of its chronological order. For full discussion of these and other instances reference must be made to the text-books. (3) In many instances they use identical language. This circumstance would be striking enough even if it were observable only in cases where discourses are reported, when it is remembered that these discourses were almost certainly spoken in Aramaic; but its significance is vastly increased when it occurs in narrative passages (Matt. xiv. 19, 20; Mark, vi. 41, 42; Luke, ix. 16, 17; Matt. xvii. 5; Mark, ix. 7; Luke, ix. 35; Matt. ix. 1–8; Mark, ii. 1–12; Luke, v. 17–20—where observe the parenthesis common to all three, 'then saith he to the sick of the palsy'), when it is shown in the use of rare words or expressions, or when all coincide in quoting the Old Testament in a way that differs both from the Hebrew and the Septuagint text.

It is only in modern times that such phenomena as these in the synoptic gospels have attracted serious attention or received critical study. Doubtless they had been often noticed before, but the fact of so large a degree of coincidence was not felt to be at all surprising. All three gospels were held to be first-hand narratives, and primarily all by the same author, the inspiring spirit of God. The resemblance, therefore, was only what might have been expected. Were further explanation pressed for, it was enough to suggest that Mark had copied from Matthew, and Luke had access to both, and this assumed dependence of the later on the earlier evangelist was not felt to affect in any way their importance as really independent, because immediately inspired. More embarrassing were their apparent divergences and even seeming contradictions in narrating what purported to be the same events (e.g. the resurrection and the post-resurrection appearances of Jesus), and their discrepancies of language in relating what seemed to be the same discourses. The reconciliation of these discrepancies and divergences (which were held to be apparent only) was the object of numerous compilers of 'Gospel Harmonies.'

The so-called 'synoptical problem' took shape in Germany towards the close of the 18th century. The discussion began in a refutation by Koppe (*Marcus non Epitomator Matthaei*, 1782) of the traditionally received view, first started by Augustine, that Mark in writing his gospel had merely followed Matthew and abridged him. Important contributions towards the advancement of the question were made in succeeding decades by such men as Lessing, Eichhorn, Griesbach, Schleiermacher, Gieseler, De Wette, Lachmann, Baur, Ewald, Bleek, Ritschl, and others too numerous to mention. In the course of the investigation three broad lines of explanation were attempted. (1) The 'Benutzungs-hypothese,' or borrowing hypothesis, sought to explain the facts by supposing that the second evangelist in order of time (whoever he was) borrowed from the first, and that the third borrowed from either or both of his predecessors. Of this theory numerous forms are logically and mathematically conceivable, and almost all of these have in the course of a century's discussion found able advocates. Perhaps the most popular form has been the 'combination' theory—that Mark is a combination of Matthew and Luke. (2) The 'Ur-evangeliums-hypothese' sought to establish the existence of a primitive written gospel, no longer extant, to which, however, all the evangelists had

access, and of which they each made independent use. (3) The 'tradition hypothesis' was that each evangelist drew his matter independently of the others from an oral apostolic tradition which had become stereotyped.

The result of the discussion has been to make it plain that no one of these theories is by itself sufficient to cover all the facts of the case. The borrowing hypothesis may account for the coincidences, but it leaves the discrepancies unexplained and inexplicable. The same remark applies to the assumption of a primitive gospel or gospels; it has been found necessary by its advocates to assume a multiplicity of lost documents in a manner that raises difficulties, historical and other, quite as great as those which it seeks to remove. The oral tradition theory, again, might serve to account for the discrepancies, but when it is sought to explain the immense amount of coincidence by means of it, the improbability of a stereotype tradition of such mass, confining itself so closely to the same incidents, told in so nearly the same order and in language so little varying, is seen to be very great. But, on the other hand, it is now more or less generally admitted that all three theories contained important elements of truth. (1) In connection with the oral tradition hypothesis it seems tolerably clear that for at least a generation after the death of Christ no important attempt was made to commit to writing any record, however brief, of the leading facts of his life or the main elements of his preaching. This was no doubt partly due to the widespread belief that his second coming and the end of the world were close at hand. The epistles were, as has already been said, the earliest literary productions of Christianity, and these were all called forth by occasions much more definite than any that had as yet presented themselves for writing memoirs of Christ. But the life and words of Christ were the continual subject of the preaching and catechising of the apostles and their converts, a subject they naturally expounded in connection with the Old Testament scriptures. These he had perfectly and completely fulfilled, and Christ was therefore sought in the Old Testament prophecies in a way that made the early Christians feel little need of a written gospel. That this traditional preaching and catechising would tend to become stereotyped within each apostolic circle is manifest; but that it was also capable of taking different forms in different circles is shown (to take obvious examples) by the want of correspondence between the narratives of the nativity and of the resurrection as given in Matthew and Luke respectively. (2) As regards a primitive gospel (or Ur-evangelium, as Eichhorn first called it), specialists are becoming more and more at one in recognising two relatively primitive documents embodied wholly or in part in the existing synoptists. These consist (*a*) in the gospel according to Mark, or an earlier draft thereof; (*b*) in a so-called 'logia' document, composed mainly of sayings and discourses of the Lord—a document which was largely drawn upon by the authors of the first and third gospels for much of what they have in common with each other apart from Mark. The reasons for abandoning the ancient view of Mark's dependence on Matthew, and for now regarding his as the earliest of our existing gospels, depend largely on considerations as to his language, style, and general point of view which cannot be even indicated here, nor does space allow mention to be made of the various minute points which have led many acute scholars to distinguish between an original Mark (Ur-Marcus) and the present form of the second gospel. The designation of the 'logia' document is taken from a much discussed fragment of a very early author, Papias, preserved by Eusebius, to the effect that 'Matthew composed *ta logia* [the oracles, or the discourses of our Lord] in the Hebrew [i.e. Jewish-Aramaic] dialect, and each one interpreted them as he could.' Schleiermacher was the first to point out the importance of this passage in its possible bearings on criticism. (3) The borrowing hypothesis, in the sense that the authors of the first and third gospels knew and very freely used the earlier work of Mark, is by no means a violent one, and seems in many cases to afford the true explanation of the facts.

The drift of current opinion among specialists may perhaps be stated somewhat as follows: When after the lapse of a generation or so it began to be seen that probably the end of all things was not yet quite at hand, and that in all likelihood the church had still before her a prolonged period of work in the present world, it was felt to be a fitting thing that the most important utterances of the Lord, which the apostles had been in the habit of quoting as supremely authoritative for all Christians, should be preserved from the risk of perversion, interpolation, or oblivion. Thus came to be written down, by some apostolic man—very likely by the apostle Matthew himself, a practised scribe—a collection of discourses, parables, predictions, and aphorisms, not improbably in somewhat loose connection, yet at the same time not without some incidental notice of the circumstances which occasioned a given utterance, or some notes of the dialogue which led up to the weighty aphorism. This collection was (as has been seen) written in Aramaic. About the same time, Mark, the 'interpreter' of Peter, as ancient tradition calls him, was arranging in Greek his fragmentary recollections or memoirs of what he had heard Peter tell of the incidents of the period of his own personal converse with Jesus. These he would not scruple to supplement with matter drawn from other sources, so long as he knew it to be trustworthy. Both the above documents obtained wide currency, the former was translated into Greek more or less inadequately, the two were seen to be mutually complementary, and it was inevitable that an attempt should be made to combine them. This was successfully done by the author of the first gospel, a writer in Greek, who had in view in the first instance Jewish Christians, and sought to bring into all possible clearness the organic development of Christianity out of the Old Testament dispensation of symbol, prophecy, and promise. After the destruction of Jerusalem, when Rome had become one of the most important centres of Christianity, there was edited in that city the present form of the second gospel, specially adapted for the apprehension and acceptance of Gentile Christians. At a somewhat later date, and possibly in Rome also, was compiled the third gospel in dependence chiefly on the 'logia' document and on Mark, but not without some knowledge of the first gospel, and with important additions from oral or written sources which cannot now be traced, but which probably represented a Judæan tradition.

Thus it appears that each of the three theories enumerated above has something real to contribute by way of explanation of the origin of the synoptic gospels. Primitive documents are embodied in them; they contain an element of ancient oral tradition; and they are not independent one of another. But no one of them is a primary document in the sense of having been written in its present form from direct personal knowledge; and it is obvious that each succeeding evangelist, in availing himself of the labours of his predecessor, did so with a feeling of perfect freedom, not claiming for himself, nor according to his fellow, nor

expecting for either from the church any title to authority as infallible.

Harmonies of the Gospels. Compilations of this nature, designed to facilitate comparison and mutual illustration of the different narratives, and to bring out their essential agreement and consistency in seeming divergence, began to be made at an early date. The earliest known is the *Diatessaron* of Tatian (q.v.). Jerome also makes allusion to the work of a certain Theophilus, Bishop of Antioch, toward the close of the 2d century, who had left a monument of his ingenuity by 'fitting together into one whole the things said by the four evangelists.' Eusebius tells us that in the middle of the 3d century a certain Ammonius of Alexandria also constructed a diatessaron, taking Matthew as his basis, and placing side by side with him the parallel passages in the other three gospels. This work suggested to Eusebius himself the plan of his own *Sections and Canons*. In this each gospel is divided separately into sections which are numbered continuously, and, further, there is a table of ten canons each containing a list of passages. The first canon, in four columns, exhibits all the passages which are common to the four gospels; the second, third, and fourth, in three columns, show the passages which are found in any three; the fifth, sixth, seventh, eighth, and ninth, those which are common to any two; and the tenth, in four separate lists, the passages peculiar to a single evangelist. This work of Eusebius, which was afterwards adapted to the Vulgate by Jerome, continued to be used as a key to the concordance of the gospels, down to the 16th century. Of post-Reformation harmonies, the earliest is the *Harmonia Evangelica* of Osiander (1537), whose doctrine of inspiration led him to believe that each evangelist must have written in strict chronological order, and that therefore, wherever there is the slightest divergence as to time, place, or circumstance between any two evangelists in any given narrative, it is necessary to assume the events thus differently related to have been distinct. On these principles he is compelled to make out that Peter denied his Lord nine times. Calvin's *Harmonia ex tribus Evangelistis Compositia* (1553) represents a much more moderate view. The number of works bearing the title of *Harmonies* or *Synopses* that have appeared during the last three centuries is very great. The best and most popular of them—such as those of Clericus (1700), Macknight (1756), Griesbach (1776), Robinson (1845) Wieseler (1843), Anger (1852), Stroud (1853)—are enumerated by Tischendorf in his own *Synopsis Evangelica*, the latest and most convenient of them all (5th ed. 1884).

Literature.—For the older literature on the synoptic gospels, reference must be made to the handbooks of Biblical Introduction and Church History, and to the more recent commentaries. Among these last that of Alford in his *Greek Testament* (7th ed. 1874–77) retains an honourable place. See also the *Speaker's Commentary*. Of translations from the German, the commentaries of Meyer and Lange claim special mention; of the former, which is the less homiletical and more scientific of the two, the latest (7th) German edition is by B. Weiss (1883–85). Keil's Commentary on Matthew appeared in 1877, and that on Mark and Luke in 1879. In the new *Hand-Commentar zum Neuen Testament* the synoptics are ably treated by H. J. Holtzmann (1889). Ewald's *Die drei ersten Evangelien übersetzt u. erklärt* (1871) is still of value. See too Reuss, *Histoire Évangelique* (1876); and compare the bibliographies under Bible and Jesus. For the apocryphal Gospels, see Apocrypha.

On the synoptical problem the fullest and latest statements are to be found in Holtzmann, *Einleitung in das Neue Testament* (2d ed. 1886), and B. Weiss, *Einl. in d. Neue Test.* (2d ed. 1889). The latter has been translated into English, *A Manual of Introduction to the New Testament* (1887). Both these writers recognise a 'logia' document, and the priority of Mark to both the first and the third canonical gospel. Weiss, however, thinks that the logia document contained a very considerable number of incidents also, and that Mark had access to it. The fullest discussions by English scholars are those of Dr E. A. Abbott in the art. 'Gospels' in vol. x. of *Ency. Brit.* (1880), and by Professor Salmon, *Historical Introduction to the Books of the New Testament* (4th ed. 1889). Dr Abbott seeks to disentangle the original 'triple' tradition borne witness to by the three synoptics; he finds that Mark is of earlier date than Matthew, and contains the earliest Greek tradition, itself a translation of the very early Aramaic tradition. Dr Salmon argues for a form of the Ur-evangelium hypothesis; he thinks the theory of a common Greek original is required by the verbal coincidences, and by the common citations of the Old Testament. Mark's gospel represents the original source most fully, but was probably latest in publication, and certainly not copied either by Matthew or by Luke. Dr Westcott in his *Introduction to the Study of the Gospels* (1851; 7th ed. 1888), which unfortunately has not been brought down to date, argues for the oral hypothesis. This theory is also that of Alford. Of the borrowing hypothesis the latest and ablest exponent is Dr Pfleiderer, who in his *Urchristenthum* (1887) shows the priority of Mark, but thinks that Matthew depended chiefly on Luke. For detailed study of the relations of the synoptics, Rushbrooke's *Synopticon* (1880), which gives all the textual facts with graphic completeness, may be characterised as indispensable. Compare also Rushbrooke and Abbott's little manual entitled *Common Tradition of the Synoptical Gospels in the Text of the Revised Version* (1884).

Gosport ('God's port'), a market-town and seaport of England, in the county of Hants, stands on the western shore of Portsmouth harbour, and directly opposite Portsmouth, with which it is connected by a floating bridge. Here are an extensive iron-foundry for the manufacture of anchors and chain-cables, naval powder-magazines, several barracks, the Royal Clarence victualling yard, which contains a brewery, a biscuit-baking establishment worked entirely by steam, and numerous storehouses, and Haslar Hospital (q.v.). The town has also some sail-making and yacht-building, and considerable coasting trade. Pop. (1851) 7414; (1891, with Alverstoke) 25,452.

Gossamer, a light filamentous substance which often fills the atmosphere to a remarkable degree during fine weather in the latter part of autumn, or is spread over the whole face of the ground, stretching from leaf to leaf, and from plant to plant, loaded with entangled dew-drops, which glisten and sparkle in the sunshine. Various opinions were formerly entertained concerning the nature and origin of gossamer, but it is now sufficiently ascertained to be produced by small spiders, not, however, by any single species, but by several, not improbably many, species; whilst it is also said to be produced by young and not by mature spiders, a circumstance which, if placed beyond doubt, would help to account for its appearance at a particular season of the year. The production of gossamer by spiders was first demonstrated by the observations of Dr Hulse and Dr Lister in the 17th century; but these observations did not for a long time meet with due regard and credit, particularly amongst the naturalists of continental Europe. It is not yet well known if the gossamer spread over the surface of the earth is produced by the same species of spider which produces that seen floating in the air, or falling as if from the clouds. Why gossamer threads or webs are produced by the spiders at all is also a question not very easily answered. That they are meant merely for entangling insect prey does not seem probable; the extreme eagerness which some of the small spiders known to produce them show for water to drink has led to the supposition that the dew-drops which collect on them may be one of the objects of the formation of those on the surface of the ground, whilst it has been also supposed that they may afford a more rapid and convenient mode of transit from place to place than the employment of the legs of the animal. As to the gossamers in the air, conjecture is still more at a loss. They are certainly not accidentally wafted up from the ground, as might be supposed; the spiders which produce them are wafted up along with them; but

whether for the mere enjoyment of an aerial excursion, or in order to shift from place to place, is not clear, although the latter supposition is, on the whole, the most probable. The threads of gossamer are so delicate that a single one cannot be seen unless the sun shines on it; but, being driven about by the wind, they often become beaten together into thicker threads and flakes. They are often to be felt on the face when they are scarcely visible. The spiders which produce these threads shoot them out from their spinnerets, a viscid fluid being ejected with great force, which presently becomes a thread; sometimes several such threads are produced at once in a radiating form, and these, being caught by the ascending current of heated air, are borne upwards, the spider along with them. It has been said that the spider has even some power of guiding in the air the web by which it is wafted up (see SPIDER). The etymology has been much disputed. According to Skeat, *gossamer*, the Middle English *gossomer*, is *goose summer*, the *summer* meaning *summer-film*. Another derivation is from *God* and *summer*, the latter word being from the Romance *samarra*, 'a skirt,' from the legend that gossamer is shreds of the Virgin Mary's shroud, which she cast away when she was taken up to heaven.

Gossan, a mining term for oxide of iron and quartz. See IRON.

Gosse, PHILIP HENRY, naturalist, was born at Worcester, 10th April 1810, and brought up at Poole. In 1827 he went to Newfoundland as a clerk, and was afterwards in turns farmer in Canada, schoolmaster in Alabama, and professional naturalist in Jamaica. Returning to England, he published in 1840 the *Canadian Naturalist*, and after another stay in the West Indies settled in England to a busy life of letters. His early experiences and observations supplied the material for his popular books, the richly illustrated *Birds of Jamaica* (1851) and *A Naturalist's Sojourn in Jamaica* (1851). His *Naturalist's Ramble on the Devonshire Coast* (1853), *Aquarium* (1854), and *Manual of Marine Zoology* (1855–56) inspired Charles Kingsley's *Glaucus*, and opened up a new branch of science to Englishmen. Gosse was elected a Fellow of the Royal Society in 1856, and over sixty monographs in its *Proceedings* are from his pen. His best-known work, the *Romance of Natural History*, appeared in 1860–62. Later and more severely scientific works were his *Actinologia Britannica* (1860) and the *Prehensile Armature of the Papilionidæ* (1885). In 1886 he placed in the hands of Dr C. T. Hudson the notes and drawings of a lifetime on the microscopic study of the Rotifera. Mr Gosse spent the last thirty years of his life in a retired South Devon village, and died 23d August 1888. EDMUND WILLIAM GOSSE, his only son, was born in London, September 21, 1849, was educated in Devonshire, and became at eighteen an assistant-librarian at the British Museum, in 1875 translator to the Board of Trade. He travelled in Scandinavia and Holland, and made himself master of the languages of these countries. In 1884 he succeeded Mr Leslie Stephen as Clark lecturer in English literature at Trinity College, Cambridge, a post from which he retired in 1889, having four years before received the honorary degree of M.A. from the university. During 1884–85 he lectured in Boston, at Harvard and Yale colleges, and in Baltimore and New York. Mr Gosse has tried various forms of verse, and possesses many of the qualities of the genuine poet. Among his writings in verse are *Madrigals, Songs, and Sonnets* (1870); *On Viol and Flute*, lyrical poems (1873); *King Erik*, a tragedy (1876); *The Unknown Lover*, a drama (1878); *New Poems* (1879); and *Firdausi in Exile, and other Poems* (1885). His chief writings in prose are in the field of literary criticism: *Northern Studies*, a series of essays on Scandinavian and Dutch literature (1879); *Gray*, in 'English Men of Letters' (1882); *Seventeenth-century Studies*, on Lodge, Webster, Rowlands, Herrick, Crashaw, Cowley, Etheredge, and Otway (1883); *From Shakespeare to Pope* (1885); *Life of Congreve* (1888); *History of Eighteenth Century Literature* (1889); *Critical Kit-Kats* (1896); and a *History of Modern English Literature* (1897). Besides these he contributed many critical essays towards *English Poets* (1880–81), edited *English Odes* (1881), and a faultless complete edition of Gray (1884). He published a Life of his father in 1890, and contributed the article POETRY to this Encyclopædia. The *Secret of Narcisse*, a prose tale, appeared in 1892.

Got, FRANÇOIS JULES EDMOND, actor, was born at Lignerolles in 1822, entered the Conservatoire in 1841, and in 1844 made his début. He was soon one of the finest comedians of his day. From 1850 to 1866 he was a member of the Comédie Française, playing with success such parts as Figaro in the older comedy, but in general regarded as the mainstay of the new dramatic school. In 1866, with the emperor's special permission, he appeared at the Odeon as André Lagarde in Augier's *Contagion*, and organised a company to carry the play through France. He has repeatedly played in London. In 1881 he was decorated with the cross of the Legion of Honour. His most finished performances were as Giboyer in Augier's *Effrontés* and *Fils de Giboyer*, and as Bernard in *Les Fourchambault*.

Gotha, a town of Germany, alternately with Coburg the capital of the duchy of Saxe-Coburg-Gotha, stands 31 miles W. by S. of Weimar, on the northern outskirt of the Thuringian Forest, and is a handsome, well-built town, with fine parks. The principal public building is the castle of Friedenstein, built in 1648 on the site of a former one, on a rock 78 feet above the town; it contains a library of 200,000 volumes and 6000 MSS., and a very valuable numismatic collection. The new museum (1878), in the Renaissance style, now harbours the picture-gallery, in which Cranach, Van Eyck, Holbein, Rubens, and Rembrandt are represented; a very excellent cabinet of engravings; a natural history collection; collections of Egyptian, Roman, Greek, and German antiquities; and a Japanese and Chinese museum. A new observatory was built in 1874. Gotha is an active industrial town, the principal manufactures being shoes, fire-engine pipes, sugar, and toys. Gotha sausages have a widespread celebrity. Several hundreds of designers, engravers, printers, and colourers of maps are employed here in the large geographical establishment of Justus Perthes (q.v.), who also publishes the *Almanach* (q.v.) *de Gotha*. Pop. (1875) 22,928; (1890) 29,134. See Beck, *Geschichte der Stadt Gotha* (1870).

Gotha, DUCHY OF. See SAXE-COBURG-GOTHA.

Gotham, TALES OF THE MEN OF, a collection of jests, in which the people of Gotham, a village in Nottinghamshire (7 miles SSW. of Nottingham), are represented as saying and doing the most foolish things. These tales are similar to the *Asteia*, or facetiæ, ascribed, without authority, to the 5th-century Alexandrian philosopher Hierocles. The stories seem to have been first printed about the middle of the 16th century, under the title of *Merrie Tales of the Mad Men of Gotham, gathered together by A. B., of Phisicke Doctour*; but they had been orally current in the time of Henry VI., reference being made to 'the foles of Gotam' in the Towneley miracle-plays, the only known MS. of which was written about that period. The initials 'A. B.' of

the putative compiler were doubtless intended by the printer to signify Andrew Boorde (q.v.), who was popularly regarded as 'a fellow of infinite jest.' But there is no reason to suppose that Boorde had any hand in the work, his initials being placed on the title-page—as also on that of the *Jests of Scogin*—in order to promote its sale. Long before the men of Gotham were saddled with the unenviable reputation of being typical blockheads similar jests had been told at the expense of the people of Norfolk, as we learn from a curious Latin poem entitled *Descriptio Norfolciensium*, written in the 12th century by a monk of Peterborough, which is printed in Wright's *Early Mysteries and other Latin Poems*. In this 'poem' occurs the familiar jest of the man who was riding on horseback with a sack of meal, and considerately placed the sack on his own shoulders to lighten the horse—a story which reappears in the Gothamite drolleries and in the *Bigarrures* of the *Sieur Gaulard*, by Étienne Tabourot (1549–90), and which is at the present day current in Ceylon.

The Gothamite jest most generally known is that of the attempt of the villagers to hedge in a cuckoo, so that it should 'sing' all the year round. Among other witless exploits they tried to drown an eel that had eaten up all the fish in their pond; they fastened their rents on a hare which they had caught, and sent it off to their landlord; a smith burned down his smithy by thrusting into the thatch a red-hot ploughshare, to destroy a wasp's nest; and twelve of them went a-fishing, and before returning home one counted their number to see whether all were safe, but omitted to include himself, whereupon they weened that one of them was drowned, and were lamenting this misfortune, when a traveller coming up, and learning the cause of their distress, soon set their minds at ease. Such jests are—*mutatis mutandis*—common to almost all the races of mankind, from Iceland to Japan, from Ceylon to the West Highlands of Scotland; and it is curious to find that the inhabitants of some particular district or village are popularly held up as arrant simpletons. In Britain, besides the men of Gotham, the 'carles of Austwick' in Yorkshire, the villagers near Marlborough Downs in Wiltshire, the 'gowks of Gordon' in Berwickshire, and the folk of Assynt in Sutherlandshire; in Germany, the Schildburgers; in Holland, the people of Kampen; in Belgium, the townsfolk of Dinant; in France, the inhabitants of Saint-Maixent, are credited with all sorts of absurdities. The citizens of Abdera, Sidonia, &c. were the noodles of the ancient Greeks, and not a few of the so-called jests of Hierocles reappear in our early English collections of facetiæ, with a blundering Welshman or Frenchman in place of the pedant of the *Asteia*, and in more recent compilations—'Joe Miller' and its congeners—the conventional Irishman or Highlander. The similarity of simpleton stories in countries far apart at once suggests the question of their origin and diffusion, as in the case of popular tales generally. No doubt in many instances they sprang up independently, for human nature is everywhere much alike; but it is equally certain that a considerable number have been borrowed by one people from another, sometimes imported orally, most frequently taken from written sources. But however widely modern scholars may differ in opinion regarding the genealogy of popular fictions, their virtual identity among divers races is an interesting evidence of the kinship of man.

The *Tales of the Mad Men of Gotham* continued to be issued in chap-book form down to the second decade of the 19th century. The first reprint of the original work was made in 1840, with an introduction by Mr J. O. Halliwell. The *Tales* were also printed in W. C. Hazlitt's *Shakespeare Jest-books* (1864); in John Ashton's *Chap-books of the Eighteenth Century* (1882); and in R. H. Cunningham's *Amusing Prose Chap-books* (1889). For a compendious collection of simpleton stories—of which the Gothamite tales form but a trifling part—see W. A. Clouston's *Book of Noodles* (Lond. 1888), which will be found to contain references to all the important books dealing with the subject, oriental and other. See also W. J. Thoms, in the *Foreign Quarterly Review* (1837, No. 40); and *Deutscher Volkshumor*, by Moritz Busch (Berlin, 1877).

Gothard. See St Gotthard.

Gothenburg (Swed. *Göteborg*), next to Stockholm the most important town of Sweden, stands at the mouth of the Göta, in 57° 42′ N. lat. and 11° 58′ E. long. Although originally founded by Gustavus Adolphus in 1618–21, the town, in consequence of numerous fires, is quite modern—regularly built and clean, with several canals, crossed by numerous bridges. The harbour is excellent, and seldom obstructed by ice. The few buildings which deserve special mention are the exchange, cathedral, and town-hall. There is a museum (art, zoology, industry) besides a fine garden belonging to the Horticultural Society. The more important industries embrace shipbuilding, iron-working, sugar-refining, the manufacture of matches, paper, wood pulp, and porter, and herring-fishing. The exports consist principally of iron, timber, grain, butter, matches, paper, wood pulp, zinc ore, hides; the imports of coal, iron, salt, flour, grain, machinery, oils, rice, wines and spirits, and sugar, the annual value of imports and exports being each about 3 millions. The port is entered and cleared by about 5070 vessels of 1,815,380 tons burden every year. The commercial importance of Gothenburg dates from the Continental blockade of 1806, when it became the chief British depôt in northern Europe. The town has given its name to the Gothenburg Licensing System, which originated here in 1865. All the wine and spirit shops are kept by a company licensed by the town authorities, and are conducted by salaried managers; all profits remaining after the company has been allowed five per cent on its capital go into the town treasury. See Licensing Laws. Pop. (1877) 71,707; (1888) 99,647; (1895) 111,250.

Gothic Architecture. Under this title are comprised the various styles of architecture which prevailed in western Europe from the middle of the 12th century till the revival of classic architecture in the 16th century. The term *Gothic* was at first bestowed by the Renaissance architects on the medieval styles as a term of reproach. This epithet they applied to every kind of medieval art which had existed from the decline of the classic taste till its revival, all other styles being by them considered as *barbarous* and *Gothic*. The name has now, however, become generally adopted, and has outlived the reproach at first implied in it. It has also become limited and defined in its application. During the 19th century the arts of the middle ages have been attentively studied, and their origin and history carefully traced; and as the knowledge of these styles has increased, a feeling of admiration has succeeded to that of contempt, and Gothic now ranks as one of the noblest and completest styles of architecture.

Origin.—The origin of Gothic architecture has given rise to many very ingenious speculations. It has been said that the style was copied directly from nature; that the pointed arches and ribs of the vaults were imitated from the overarching branches of trees; and that the stems of an avenue were the originals of the pillars of the Gothic aisles. Others have strenuously maintained that the invention of the pointed arch was a mere accident, arising from this form having been observed in the interlacing of the circular arches of a Norman

arcade. It has also been stated that the style was imported from the East during the Crusades, and that the mediæval architects had but little to do with its origin. More careful study of the Gothic buildings which remain to us has dispelled these fanciful ideas, and settled the origin and progress of the art on historical as well as internal evidence.

To trace Gothic up to its primary elements we have to go far back in the world's history. Many diverse styles have prevailed at different epochs and in different countries, and the later styles have invariably been influenced by those which preceded them. All the various styles of architecture may, however, be classed under two groups, the representatives of which are Greek architecture and Gothic architecture. These are the two typical styles, and in them are contained and exhibited in a very pure form the elements from which all other styles are produced. This is true in the same sense as it is also true that all things in nature are derived from a few primary elements. But as there are many varieties in nature, so there are many developments of the two typical forms of architecture, all of which may be classed as styles.

The principles which underlie the two great divisions of architecture are structural in character; for the decorative features of all true styles are founded on the construction. The first of these divisions is distinguished by the employment of the horizontal beam as the method of spanning openings; while in the other the arch is the means used for the same purpose. All other specific differences of style are subordinate to these leading factors. Of these divisions Greek architecture is accepted as the highest type of the *trabeated* style—i.e. the style whose principal feature is the straight lintel; Gothic, as the type of *arcuated* architecture, in which the voids are spanned by arches. These typical forms present many varieties, Roman Architecture (q.v.) being the transitional form between them. The trabeate form of construction was common to the primitive inhabitants both of Greece and Italy. The early Romans' buildings were therefore trabeate in principle, and their exteriors were decorated with columns crowned by straight architraves and cornices. But in course of time they gradually introduced inside these, and hidden from view, a real construction with arches and vaults. These constructional elements had long been in use amongst the Etruscans in Italy for drains, bridges, gateways, and other utilitarian purposes, and by slow degrees they obtained recognition as architectural features in the elevations. Their use gradually extended, especially in the construction of interiors, and by means of vaults the Romans were able to roof in large areas without encumbering the floor with pillars. This was found to be a very advantageous and lasting system of construction, and under the empire was carried out in many important examples, as, for instance, in the baths of Caracalla and Diocletian, the Basilica of Maxentius, &c. In their works of public utility, where use, not decoration, was the chief object, the Romans always adopted the arch as the fittest mode of construction—as in their Aqueducts (q.v.), bridges, &c. The arch thus came gradually more and more into use; and about the time when the barbarians first overran the provinces the arcuated form of construction was universal, and some attempts had been made to conform the trabeate decoration to the circular arches by bending the architrave round the curve—as in the palace of Diocletian at Spalato in Dalmatia.

To the Romans, therefore, is due the introduction of an arcuated construction with a well-developed internal, and a partially-developed external, decoration. The early Christians adopted their forms of construction and decoration from the Romans. They were also indebted to them for the plans of the buildings which became the types of the Christian sacred edifices during the middle ages. There was no new style created by the early Christians. Their buildings were all founded on Roman design till about the 10th century. The Basilica (q.v.), or Roman court-house and market-place, was found to be admirably adapted for early Christian worship, and the general opinion has hitherto been that the church was derived from the basilica. But this view has been combated by Professor Baldwin Brown in his work *From Schola to Cathedral* (1886), in which he derives the form of the nave from that of the *scholæ*, or halls of meeting of guilds permitted under the empire, amongst which the burial societies of the Christians were numerous; whilst he attributes the apse, a very prominent feature in early churches, to the memorial cellæ erected by pagans and Christians alike in the cemeteries, and afterwards introduced along with the bodies of saints into the churches. There can be no doubt, however, that the circular temples were the prototypes of the Christian Baptisteries (q.v.) which usually accompanied the basilicas. In erecting their buildings the Christians not only adopted the plans and mode of construction, but used the actual materials of the buildings of the Romans, many of which had been destroyed by the barbarians. Where such materials were abundant—as in Rome and central Italy—the early Christian architecture very closely resembled that of the Roman buildings which had preceded it. But in more remote districts the builders, finding no ready-made materials at hand, had to design and prepare new ones. In doing so they followed as closely as they could the Roman originals, but their buildings partook more of the constructional than the decorative elements of Roman architecture. The Roman ornament thus dropped out of use; and when, in process of time, decoration was desired, each new people followed its own ideas. The traditional Roman decoration thus became to a great extent lost, and new styles developed. In this way the Teutonic tribes introduced into their architecture the scenes of hunting and fighting in which they rejoiced, the ornament showing the figures of animals and men intermixed with the acanthus leaves and other foliage of Roman design.

The different forms of vaulting developed by the Romans were followed throughout the empire during its decline, but gradually special forms were adopted in the different provinces. Thus the architects of the East preferred the *dome* as the distinguishing feature of their style, and those of the West retained the plain tunnel-vault. The former style is called Byzantine (q.v.), and has been the type of all Eastern mediæval architecture; and the latter Romanesque (q.v.), and has been the origin of all the mediæval architecture of western Europe. This Romanesque style varied much in different provinces—being more Roman in type in central Italy and Provence where Roman examples abounded, and more Gothic on the Rhine and in Switzerland and Lombardy where the Teutonic elements prevailed. Roman forms were still adhered to in the Gothic provinces as late as the 9th century, when we find Charlemagne erecting his great mausoleum at Aix in imitation of San Vitale at Ravenna, which was itself derived from a Roman original.

History. The various modifications in different countries all contributed to the general progress of the art; but, as might be expected, it is to the banks of the Rhine where the successors of Charlemagne chiefly dwelt that we must look for the first step in the development of Gothic architecture.

The following short sketch of the history of the vaulting will show how this occurred.

The Roman basilicas, and, like them, the early Christian churches (for ground-plan see the article BASILICA), were divided into a central nave and two or four side-aisles, the former separated from the latter by one or two rows of columns on each side. These columns carried arches on which rested the side-walls of the nave, which were carried sufficiently high to clear the roofs of the side-aisles, and admit windows to light the central nave. This row of windows afterwards became the Gothic Clerestory (q.v.). At the east end of the nave was a great arch leading into an open space, in the centre of which was the apse. The latter was semicircular in plan, and was usually roofed with a vault in the form of a semi-dome. This feature was also afterwards more fully developed, and surrounded with radiating chapels in Gothic churches. The nave and side-aisles were originally roofed with wood, but, owing to their frequent destruction by fire, it became necessary to cover the churches with a more enduring kind of construction. It was then attempted to introduce vaulting; but the skill of the workmen had degenerated, and many efforts were needed before a system suitable for the requirements of the period and within the capacity of the builders was arrived at. But, as we shall presently see, when the principle of pointed vaulting was once grasped, the development of the style followed with astonishing rapidity. To trace the progress of vaulting from the early simple tunnel-vault copied from the work of the Romans to the fully-developed and magnificent groins of Gothic cathedrals is a most interesting inquiry; and indeed includes the history of the development of Gothic architecture. There is one consideration which will help to explain how the Roman vaults came to be gradually modified and new forms sought out. To the Roman emperors who built the splendid vaults of the baths, and who had a subdued world at command, *materials* and *labour* were of small consideration. They could therefore afford to build in a style which required perfect materials and workmanship. But medieval princes and bishops could obtain neither. To economise these, therefore, the utmost skill and attention were required. It was necessary to avoid those large and expensive materials of which the Romans were so lavish, and to adopt the simplest and easiest forms of construction.

The first vaults tried were simple semicircular tunnel-vaults. It was found that these, besides being very gloomy, required very massive walls to resist their thrust. An attempt was then made to relieve this thrust by *transverse arches* (*a*, *a*, fig. 1) thrown across—at intervals—under the tunnel-vault, to act as strengthening ribs. This idea was

Fig. 1.

also borrowed from Roman precedent. Buttresses with a slight projection were applied outside to abut the transverse arches, and a beam of wood was sometimes introduced at the wall-head from buttress to buttress to assist in opposing the thrust of the vault.

This was the first attempt to concentrate the weight of the vault on single points. In the side-aisles, where the span was small and manageable, the Roman intersecting vaults (*b*, *b*, fig. 1) were used; and as the main roofs with their tunnel-vaulting were found very gloomy and ill lighted, it was considered desirable that similar intersecting vaults should be used to cover them also, so as to admit of the clerestory windows being raised in order to light the vaulting. But how was this to be managed with the inferior materials and workmanship at command? If the transverse arches AB, CD (fig. 2) are semicircular, and the side-arches AC, BD the same—the vault being formed by two intersecting cylinders—then the intersecting groins AD and CB must be elliptical. This

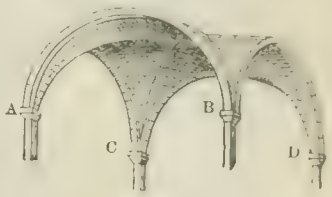


Fig. 2.

was a difficult form of construction: the medieval builders found it easier to construct the groin or diagonal arches of a circular form with radius EA (fig. 3), and to fill in the triangular spaces ABE, &c., with slightly domed vaults. These semicircular edges or groins gradually came to form independent ribs. At first they were only marked by a bead on the angle, but being the chief constructional element of the vaulting they soon came to be distinctly separated from the rest of the vault as independent members with the name of groin ribs, the development of which played so important a part in Gothic vaulting. When the space to be covered was square the above form of vault was found to answer, and each bay of the nave usually included two bays of the side-aisles, as in fig. 4. But this arrangement looked awkward externally, the windows of the clerestory not grouping well with those of the side-aisles. A transverse arch (*a*, *a*, fig. 3) was then introduced, carrying up the design from the nave piers to the vaulting.

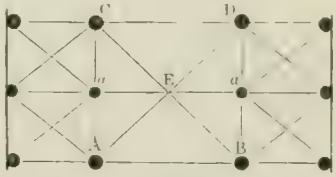


Fig. 3.

This form of vault is called hexapartite. All the above varieties of vaulting were fully developed during the 11th and 12th centuries in the round-arched styles of the Rhine.

In France these forms were also tried; but it was found that the semicircle is not a good form of arch unless loaded on the haunches, many of the churches which were vaulted in this manner during the 11th century having to be buttressed or rebuilt in the 12th and 13th centuries. In Provence (where the Roman influence continued to be strongly felt, owing to the large number of Roman buildings still surviving in the country) the tunnel-vault (fig. 4) was in use probably as early as the 9th or 10th century. But the form of the vault adopted then differed from that of the Romans in being pointed instead of round. The pointed form may have been borrowed from the Moors in Spain, by whom it was used as a decorative feature, but it was undoubtedly adopted in Provence as a simply-constructed method of vaulting. This form of arch was thus probably suggested in the 12th century to the architects of the north of France, who at once saw how well it would overcome the

difficulty of the yielding of the haunches in the semicircular arch. They were thus led to the adoption of the pointed form for their transverse arches *as a structural expedient*, and still retained the semicircular form in the groins. The next question which engaged attention, and the solution of which led to the further use of the pointed arch, was the

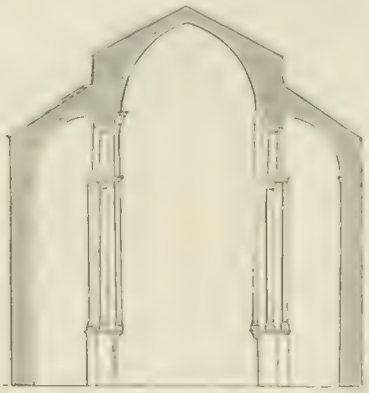


Fig. 4.

vaulting of oblong spaces. This had been tried with semicircular arches, but it was found that with that form the vault would require to be very much domed—the diameter of the arches *c*, *c* (fig. 1) being so much smaller than that of *a*, *a*—whereas by using pointed arches, of different radii, for the transverse and side arches all might be kept to about the same height. This is more fully explained by fig. 5. If AB be the diameter of the transverse arch (*aa*, fig. 1) and AC that of the side arches (*cc*), it is clear that the semicircular side arch ADC cannot reach the height

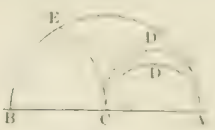


Fig. 5.

Fig. 6.

of the transverse arch AEB, even when stilted as at D'. But in the pointed arch CEB the same diameter rises to very nearly the height of the transverse arch. The pointed arches ACB and A'CB' (fig. 6) show how easily arches of this form, whatever their diameter, can be carried to the same height. By the introduction of this new form of arch the vaulting was strengthened, and the thrust brought to bear steadily on single points.

We have now traced the history of vaulting from the time of the Romans to the 12th century, when the principles of Gothic pointed vaulting were fully developed; and we have dwelt particularly on this subject, because it includes the principles which regulated the whole of the Gothic style. Gothic was not the invention of an individual, but a necessary growth—a gradual development from structural requirement. This is clearly the case with regard to the vaulting, as we have endeavoured to show above, and the same might be proved regarding every member of the style. Thus it might be shown how the ribs became gradually more decided, expressing the part they bore in the support of the roof; how the nave piers or pillars were subdivided by degrees into parts, each shaft bearing on a separate cap a separate member of the vaulting; how the buttresses were developed as they were required to resist the thrust of the groins concentrated on points; and how the flying buttresses were forced upon the Gothic architects much against their will, as a mode of supporting the arches of the roof.

The history of the flying buttress is curious. The thrust of the tunnel-vault was sometimes resisted by half-tunnel-vaults over the side-aisles (see fig. 4). The latter, therefore, required to be high, and a gallery was usually introduced. In the Narthex at Vezelay (fig. 7) we have this gallery with the vaulting used as a counterpoise to that of the central vault. This is a fine example of vaulting in the transition state, that of the gallery resisting the main vault, as in fig. 4, and being at the same time groined.

Fig. 7.

This leaves rather a weak point opposite the transverse arches, to strengthen which the part of the semi-tunnel-vault (fig. 4) opposite the transverse arch is left standing, although the rest is altered by the groining. At Vezelay (fig. 7) this arch timidly shows itself as a small flying buttress above the roof. It is easy to see how this idea would gradually develop itself into the bold 'arc-boutant' of a later date. The galleries were, in later examples, dispensed with to admit of larger clerestory windows, and the flying buttresses were left standing free. The architects finding them indispensable, then turned their attention to render them ornamental. *Pinnacles* may also be shown to owe their origin to their use; they acted as weights to steady the buttresses and piers. We shall, under their separate heads, point out how each element of Gothic architecture was in the strictest sense constructional, the decoration being in harmony with its actual use, or as Pugin has said, 'decorated construction, not constructed decoration.'

The full development of Gothic vaulting, which was the forerunner of the whole style, was first carried out in the royal domain in France about the middle of the 12th century.

The Normans had settled in the north of France more than two centuries before this, and had applied their talents and the fruit of their conquests to the building of splendid temples in honour of their victories. In doing so they followed out the round-arched style, and brought it forward by a great stride towards true Gothic. See NORMAN ARCHITECTURE.

South of the royal domain, in Burgundy, there had existed for centuries great establishments of monks, famous for their architecture. The abbey of Cluny was their central seat, whence they sent out colonies, and built abbeys after the model of the parent one. The style in which they worked was also an advanced Romanesque, but different

from that of the Normans. We have already seen that another school existed in Provence; and in Aquitaine, Auvergne, and Poitou still further varieties of Romanesque were developed.

Between these provinces lay the royal domain. Owing to the weak state of the kingdom, architecture had hitherto made little progress in the Isle of France. About the beginning of the 12th century the monarchy revived, and for the next two centuries the royal domain was governed by wise and powerful monarchs, who succeeded in re-establishing the royal supremacy. A new impulse was thus given to the literature and arts of the country, by which architecture profited largely. From the state of ruin into which the kingdom had fallen, there were scarcely any churches existing worthy of the new state of things. Novel and great designs were formed: hitherto almost all the important churches of France belonged to the abbeys; now, under the royal patronage, cathedrals began to be built. The bishops, envious of the power of the monks, lent their powerful aid, and the whole of the laity, especially in the towns which were now emancipating themselves and forming independent communes, joined heartily in the work. With such a universal impulse, no wonder that architecture took a great stride and new forms were introduced. It is to this period and people that we owe the earliest development of the pointed Gothic style.

We have already seen at Vezelay how nearly the Burgundian monks had approached to Gothic. To complete the development it only required the side-walls and vaulting of the nave to be raised, so as to admit of windows over the roofs of the side-galleries; and the flying buttresses to be raised with them, so as to receive the thrust of the vault —the latter being constructed with pointed groin ribs, and the side and transverse arches carried to the height of the groins. The lay architects of the royal domain soon accomplished this step, and the new style sprung up and progressed with the most astonishing rapidity.

The earliest example we have of the fully developed Gothic style is the cathedral of St Denis, in which are deposited the remains of the kings of France. It was founded by the Abbé Suger in 1144. The cathedral of Notre Dame of Paris soon followed, and almost contemporary with it arose the magnificent cathedrals of Chartres, Rheims, Amiens, Beauvais, Bourges, and a host of others.

Another cause which tended much to hasten the progress of the style was the invention about the same time of painted glass (see GLASS, PAINTED). The Romanesque architects had been in the habit of decorating their churches with frescoes and other paintings; but this new mode of introducing the most brilliant colours into their designs was at once seized upon by the northern architects. The small round-arched windows, which were still in many instances retained long after the pointed arch had become usual in the vaulting, no longer sufficed when filled with stained glass to light the churches. They were therefore enlarged, two or even three were thrown into one, divided only by mullions; this compound window was again increased until the compartment of the clerestory became almost wholly absorbed. The architects were then forced to conform the arches of their windows to the pointed outline of the side-arches of the vaulting. This desire for more and more space for stained glass was the origin of the window-tracery which forms so beautiful a feature of the style. It is the last attenuated remains of the wall space of the clerestory, which was at last entirely absorbed.

Fig. 8, from Notre Dame, Paris, is a good illustration of the mode of progress of French Gothic. The left-hand portion of the elevation shows the kind of fenestration adopted. The clerestory windows are small; and, in order to admit more light, the windows and vault of the gallery are kept very high. This was the original design; but during the construction of the cathedral the importance of stained glass had become so great that the design was altered so as to give larger windows in the clerestory for its display, as shown on the right-hand portion of the elevation. The gallery is at the same time reduced to a mere triforium with very small windows, and the aisle windows are greatly enlarged. The upper or clerestory window also shows the simple early form of tracery; that in the aisle window being later and more advanced.

Fig. 8.

Fig. 9.

Fig. 9 shows two bays from Tournay Cathedral, and is a good specimen of the mode in which the whole space of the side-walls was made available for window-tracery and stained glass.

The further history of Gothic architecture in France is simply the enthusiastic following out, to their furthest limits, and in the most logical and artistic manner, of the principles above indicated, on which the early architects had unconsciously been working when they originated the style. So long as the Gothic architects worked on these principles they advanced and improved their architecture. When, however, the style had become fully developed and matured (about 1300 A.D.) the spirit of progress died. No new features were developed. The architects seemed to think that in its main elements their style was complete, and contented themselves with continuing the traditional style of their forerunners, and pushing to their extremest limits the principles handed down to them. They became proud of their scientific knowledge, and of the accuracy with which they could calculate and provide for the thrusts of the different arches, and the artistic element became subordinate to the engineering. The height of the cathedrals was extended till, at Beauvais, it exceeded the power of the architects to prop up the vaulting. The system of buttresses and pinnacles was developed with the utmost skill, till at last the original simplicity and repose of the designs were lost, and the exteriors presented a scientific but confused system of scaffolding and propping-up in stone (see BUTTRESS). The simple and beautiful forms of the early tracery became altered into all manner of flowing curves, graceful but unmeaning, in the Flamboyant period (q.v.); and, in short, the art became lost in mere cleverness of design and

dexterity of execution, and the architect's place was usurped by the freemason.

It is in the cathedrals of the 12th and 13th centuries, above referred to, that we find the noblest development of the Gothic style. Everything tended to this result. The nation was united in the effort—all the science, all the arts, all the learning of the times were centred in the church. In it, and that almost exclusively, the sculptor, the painter, the historian, the moralist, and the divine, all found scope for the expression of their ideas on the sculptured walls, porches, and niches, or the painted windows of the cathedrals—the churches of the people. The development of the decorative features progressed simultaneously with that of the constructional. The Roman acanthus and other enrichments were long followed, but gradually modified (as above mentioned) by Teutonic influence as shown in the hunting and fighting, as well as religious scenes represented in the 'historied' capitals and sculptures of their architecture wherever they penetrated. This style of carving became traditional, and was adhered to for centuries by the monastic orders. But at the revival of the 12th century these traditional forms were gradually departed from, and the architects sought inspiration for their sculpture directly from nature. At first the foliage was treated conventionally, but gradually came closer to nature, till in the completed style of the 14th century each leaf and flower exactly imitated the shape and embodied the spirit of the natural type. Mouldings, buttresses, pinnacles, and all the smaller features following the rule of nature were infinitely varied and beautiful. These will be treated of under their separate heads.

The progress of the Gothic style in other countries is no less remarkable than in France. At no time in the world's history did any style of architecture ever spread so wide, or give rise in such a short time to so many splendid buildings. No sooner had the style been invented in the central provinces of France, than it immediately spread over the west of Europe, superseding all other styles, and producing similar splendid buildings wherever it went.

We shall note shortly a few of the peculiarities of the style in England, Germany, and Italy. It spread also over the south of France and Spain; but in the latter countries it presents the character of an imported rather than that of a native or freely-adopted art.

English Gothic.—At the Conquest in 1066 the Normans introduced their round-arched style, some fine specimens of which still exist both in England and Scotland—St Cross, near Winchester; Durham Cathedral; Kelso and Jedburgh Abbeys, &c. But these buildings are not copies of those of Normandy. The English have always, in adopting styles, given them a national impress. As it was with the Norman, so it was to a still greater degree with the pointed Gothic, which was introduced into England about 1174 by William of Sens, who superintended the rebuilding of Canterbury Cathedral. The English architects soon began to follow out a pointed style of their own. They borrowed much from France, and worked it out in their own way, forming what is now called the *Early English* style. The differences between the early Gothic of France and England extend to almost every detail. The mouldings, bases, caps, pinnacles, buttresses, and foliage of the latter are all impressed with the early English feeling. In France the character of the early Gothic is one of unrest—a constant struggle forward. In England the effort after progress is not so distinct—that of carefulness and completeness prevails. In the *plans* of the cathedrals the differences are marked (see figs. 10, 11), as the accompanying plans of the cathedrals of Salisbury and Amiens show. The eastern termination of a French cathedral or church is invariably circular ended or apsidal—a form derived from the early Christian apse. The English cathedral, on the contrary, has almost always a square east end. The French transepts have almost no projection beyond

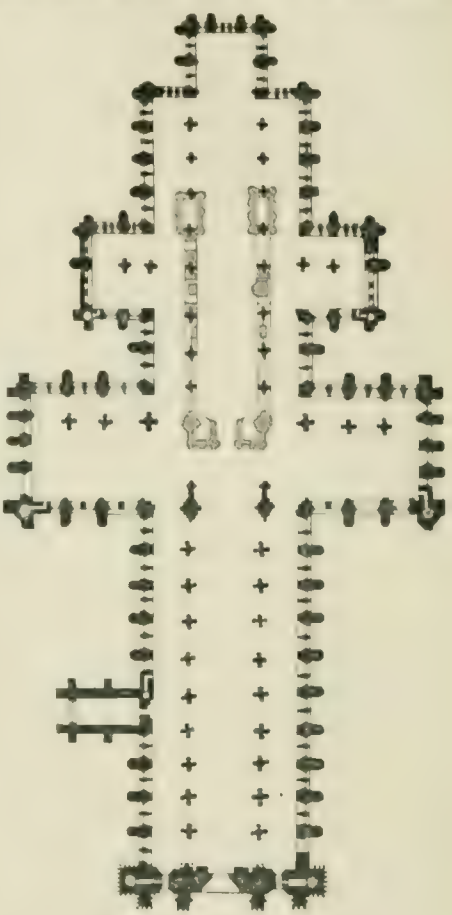


Fig. 10.—Salisbury Cathedral.

the line of the aisles; the English ones have great projections—Salisbury (q.v.) and Canterbury (q.v.) having *two* transepts. The French cathedrals are short and very lofty; the English, long and comparatively low. The French buildings are perhaps the grandest and most aspiring, the English the most finished and picturesque.

The construction of the exterior of the 'chevet' or apsidal east end was a difficulty with the French and Germans, and, as at Beauvais and Cologne (q.v.), resembles an intricate and confused mass of scaffolding. One of the churches in which this picturesque feature is most successfully carried out is St Ouen, Rouen. The great complication of pinnacles and flying buttresses which marks so many of the great French churches is here reduced to a minimum. This difficulty was avoided by the English square ends, which afforded scope for a large field of stained glass in a single great traceried window, as in most of the English examples.

The western portals of the French cathedrals, such as Rheims (see DOOR) and Amiens (q.v.), are among the boldest and most magnificent features of their architecture. In these the English were

occasionally not far behind, as the western portals of Peterborough and York show; but the English portals are generally smaller and less effective than the French ones.

The outlines of the English cathedrals are usually very picturesque and well balanced, the western

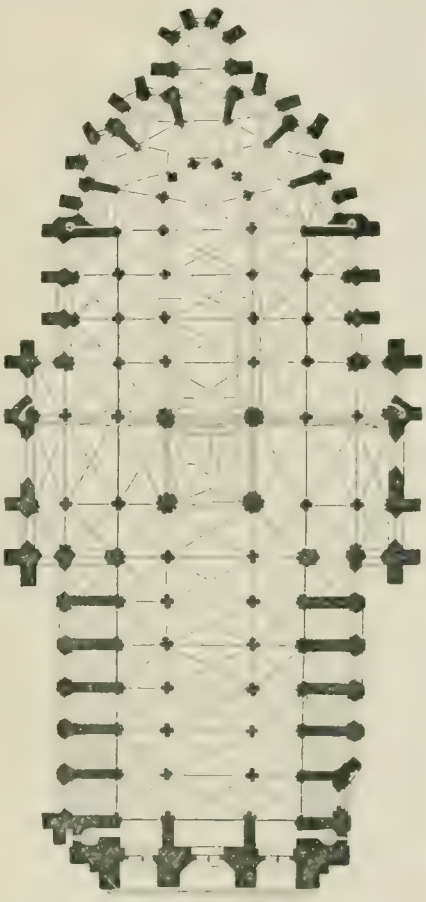


Fig. 11.—Amiens Cathedral.

towers grouping harmoniously with the central, and in this respect the English have the advantage.

The vaulting of the French churches is almost always quite simple in design, but in the application of vaulting the English carried out their own ideas. They were always fond of wooden roofs, and probably this may have led to the invention of the many beautiful kinds of vaults which form so fine a feature of English Gothic (see FAN-TRACERY). In England the style lasted longer than on the Continent, being retained till the time of Henry VIII. about the middle of the 16th century.

The Germans were nearly a century in adopting the pointed style after its invention in France; and when it was introduced it retained the appearance of a foreign importation. It never was so completely naturalised as in England. The so-called beauties of the German Gothic are, for the most part, to be regarded rather as excellent specimens of masonry than as artistic developments of the style. The open-work spires, for example, which are of frequent occurrence in England, are fine pieces of construction, and have a striking effect; but from the first there is a tendency to commit the work to masons, who rejoice in displaying their manual dexterity. The later Gothic in Germany is the most splendid development of the stone-cutter's art and the draughtsman's ingenuity; these run riot, while the artist is entirely wanting. The distortions of fig. 12 may serve as an example.

Fig. 12.

The Gothic style forced its way also into classic Italy, but there it was never understood nor practised in its true spirit. It was evidently an imitation from the beginning. The Italian architects tried to vie with those of the north in the size of their buildings, some of which, such as San Petronio at Bologna and Milan Cathedral, are enormous. The former illustrates the defects of Italian Gothic. The arches are very wide, and there are few piers. There is therefore a bare and naked effect, which is not compensated for by any richness of sculpture or colour. There is a want of *scale* about Italian Gothic buildings, as there is about those of Italian classic architecture, both ancient and modern. Size alone is depended on for producing grandeur of effect. No attempt is made to mark the size, and give a scale by which to judge of the dimensions of the buildings in those styles. A large classic temple is simply a small one magnified. In true Gothic architecture the case is different. Not only are the general dimensions magnified in a large edifice, but also the parts are multiplied. The columns and shafts remain of the same size, but their number is increased. The arches are enlarged in proportion to the general dimensions, but the caps, bases, and mouldings remain of the same size as in a smaller building, and thus indicate the greater size of the arch. A true Gothic building of large dimensions thus tells its own greatness, but in a classic or Italian Gothic edifice the size has to be found out. Stained glass was little used in Italy. It may have been intended to decorate the walls, which otherwise have such a bare and cold appearance, with frescoes—as indeed is the case in a few examples. The church of St Francis, at Assisi, is the most remarkable building of this kind, and is a very interesting example of fresco-decoration (see FRESCO). Italian Gothic, however, was most successful, especially in Venice and Verona, in domestic edifices, the palaces of those cities being amongst the finest structures of their kind in Europe. The medieval monuments of Italy, too, are especially beautiful and appropriate.

The towns of Italy, being early enfranchised, have also many municipal buildings in the Gothic style; and to these, as well as to those of Belgium, allusion is made in the articles on the several towns and in MUNICIPAL ARCHITECTURE.

We might, in the same manner, trace the Gothic style in all the other countries of western Europe; but its history is similar in all. It is in England and France that the true spirit of the style was most felt and the finest examples remain. Our space has not permitted us to enter minutely into the various styles of Gothic in each country. The

more important of these will be treated separately (see EARLY ENGLISH, DECORATED, PERPENDICULAR, FLAMBOYANT).

We may, however, state generally that both in France and England the style had a complete existence—it was born, arrived at maturity, and died. When the spirit of the early architects had pushed the design to its utmost limits they rested from their labours, well satisfied with their splendid achievements. Their successors occupied themselves with forms and details, and with the perfecting of every minute part. The art finally passed away, and left architecture in the hands of trade corporations—masons, carpenters, plumbers, &c.—who monopolised the whole work, and acted independently, to the exclusion of one directing mind. The result was as we have seen: architecture became masonic skill, and Gothic was finally superseded by the revival of classic architecture in the 16th century. The Renaissance of the arts of Greece and Rome during the last two or three centuries has in the 19th century been followed by a revival of Gothic architecture. Even during the 17th and 18th centuries a few attempts were made to resuscitate the old style in churches, and in the 18th century a bold effort in the direction of introducing it into domestic architecture was undertaken by Horace Walpole, Batty Langley, and others. But the present revival may be said to have fairly commenced in 1819, when Rickman published his *Attempt to discriminate the Styles of English Architecture*, a very careful and complete work, the conclusions of which have been generally adopted and adhered to. Other works by Pugin, Cotman, Britton, and others soon followed, illustrative of Gothic architecture both at home and abroad. One of the most prominent supporters of the revival was Augustus W. Pugin (1812–52), who both by his writings and in his practice brought the Gothic style practically before the public in the first half of the 19th century. Since that time it has been greatly used, almost all our modern churches and many other public buildings being designed in the Gothic style. The names of Edward Barry, George Gilbert Scott, E. Street, and Burgess are well known in connection with the Houses of Parliament, the Law Courts in London, and numerous churches and cathedrals both in England and abroad. A reaction has within recent years taken place, especially in secular structures, but Gothic is still regarded as the most suitable style for ecclesiastical edifices.

In the United States classical models were generally followed, even in ecclesiastical architecture, till the building of Trinity Church, New York, in 1840, by Richard Upjohn—the first instance in which the Gothic style (English Gothic) was used with skill. Since then Gothic has been the prevalent style for churches; and a modified Gothic, mainly North Italian, has also been much used for civil buildings in the United States.

In France, the land of its birth, Gothic architecture has been very thoroughly studied, and its principles and beauties have been admirably analysed and illustrated, notably in the splendid work by the late Viollet-le-Duc, *Le Dictionnaire raisonné de l'Architecture française*.

The beauties of Italian Gothic have also had their admirers, and have been charmingly described and illustrated by Ruskin. But this style has not been much adopted in northern countries.

In the changes of fashion with regard to architecture Gothic may at present appear to be receding, but the study and elucidation of its principles have done much to modify men's views with regard to the elements of the art, and will doubtless continue to influence the principles and practice of the architecture of the future.

See Bloxam's *Principles of Gothic Architecture* (1829; 11th ed. 3 vols. 1882), Rickman's *Gothic Architecture*, by Parker (1848); Britton's *Antiquities of Great Britain* (1805–); Pugin's works, such as the *Examples of Gothic Architecture* (1835) and the *Specimens*, &c. (1823); E. Sharpe's *Architectural Parallels* (1848); Viollet-le-Duc, *Dictionnaire* (1854–69); Street's *Brick and Marble of Middle Ages* (1874) and *Gothic Architecture in Spain* (1869); Ruskin's *Stones of Venice* (1851–53); Fergusson's *History of Architecture* (1865–76).

Gothland (Swed. *Gotaland* and *Götarike*), the southernmost of the three old provinces of Sweden, with an area of 35,800 sq. m. and a population of over two and a half millions. — (2) A Swedish island (Swed. *Gottland*) in the Baltic, 44 miles E. from the mainland, constitutes with Farö, Gotska, Sandö, and other smaller islands the province of Gottland or Wisby. Area, 1217 sq. m. The island consists mainly of terrace-like slopes of limestone, which are encircled by cliffs broken by numerous deep fiords, more especially on the west coast; the eastern parts are flat. The climate is mild. Next to agriculture, the chief occupations of the inhabitants, (a little over 50,000) are shipping, fishing, sealfishing, fowling, and lime-burning. In the middle ages the island belonged to the German Hanseatic League, but was restored to Sweden in 1645. The capital is Wisby (q.v.).

Goths. The native name of the Teutonic people known as Goths (in Lat. *Gothi*, *Gotthi*) had the two forms *Gutans* (sing. *Guta*) and *Gutos* (sing. *Guts*); from the latter was formed the compound *Gut-thiuda*, 'people of the Goths.' Their earliest known abode was on the southern coasts and the islands of the Baltic. The island Gothland derives its name from them. The Scandinavian traditions, reduced to writing in the 12th century, speak of a country on the Baltic called *Hreidhgotaland*, which must have owed its name to the branch of the Goths called in Anglo-Saxon poetry Hræde, and (perhaps with etymologising corruption) Hréthgotan and Hréthas. The Hrædе are stated in an Anglo-Saxon poem (*Widsith*) to have had their home on the Vistula. Whether Goths ever inhabited the Scandinavian peninsula is doubtful; the 'Gothland' of Sweden is etymologically not 'the land of the Goths,' but 'the land of the Gauts' (in A.S. *Géatas*), a distinct, though doubtless a kindred people.

The native tradition of the Goths, according to their historian Jordanis (6th century), represented them as having originated from Scandinavia. This tradition, however, is probably a mere development of the common Teutonic myth which placed the creation of mankind in an unknown region beyond the northern sea, and has therefore no historical value.

The elder Pliny (died 79 A.D.) mentions the Goths (*Guttones*) in two passages of his *Natural History*, once in a mere enumeration of the Germanic peoples, and once in what purports to be a quotation from the Greek traveller Pytheas (4th century B.C.). If Pliny's citation be accurate, Pytheas referred to the Guttones as dwelling on the shores of an estuary called Mentonomon, and as trading in amber, gathered by the inhabitants of an island distant from them a day's sail. It has, however, been suggested that the people mentioned by Pytheas were the Teutones living near the mouth of the Elbe. In a Greek MS. it would be easy to misread *Teutones* as *Guttones*, and the former name actually occurs in the context. But even if this be so, we may perhaps infer that in Pliny's time the 'Guttones' were a maritime people, as he quotes the supposed statements of Pytheas without any remark. A generation later the Goths (*Gotones*, *Gothones*) are spoken of by Tacitus, who says that among them the kingly power was greater than

among the other Germanic peoples, though they still retained their freedom. He relates that in the reign of Tiberius a Marcomannic exile named Catualda, who was resident among the Gotones, collected an army and made himself king of the Marcomanni. The indications given by Tacitus seem to imply that he regarded the Goths as the easternmost people of Germany (the boundary of which was the Vistula), and that their territory reached to the Baltic. Their southward emigrations must have commenced soon afterwards, for the geographer Ptolemy (2d century) assigns to the 'Gythones' a position in Sarmatia (on the *right* bank of the Vistula), divided from the sea by the Slavonic Wends. The history of their southward wandering is unknown, the story told by Jordanis being obviously mythical. What seems certain is that early in the 3d century the Goths, vastly increased in numbers by the accession of many conquered peoples, were occupying a territory north of the Black Sea and the Danube mouths. The eastern portion of them received the distinctive names Ostrogoths ('East Goths') and Greuthungs ('dwellers on the sand'), while the western portion were called Visigoths ('West Goths') and Thervings (probably 'dwellers among the trees'). Mingled with the Goths proper, or adjoining them, were a number of other East Germanic peoples who, like them, had emigrated from the Baltic coasts. Chief among these were the Vandals and the Gepidæ, the neighbours of the Goths on the west and on the north respectively. The geographical position of the Heruli, Burgunds, Scirians, Rugians, and Turcilings at this time cannot be determined. All these nations were often classed together under the general name of Goths.

In the reign of the Emperor Philip the Arab (248-49) the Goths are said to have been ruled by a king named Ostrogotha. (There is no strong reason for regarding this name as an etymological figment: it does not mean 'Ostrogoth,' but is to be compared with such Teutonic names as Austrowald, Easterwine, Earcongota.) In his reign a war broke out between the Goths and the Roman empire; at the battle of Abritta the Romans were totally defeated, and the Emperor Decius and his son were killed. For eighteen years the eastern provinces of the empire suffered terrible ravages from the Goths, but these calamities were avenged by the victories of the Emperor Claudius (thence surnamed Gothicus). After the death of Claudius in 270, his successor Aurelian conceded to the Goths the province of Dacia, on condition of furnishing a body of 2000 men to the imperial army. Such of the native inhabitants as did not choose to remain as subjects of the Goths were provided with new settlements south of the Danube. With some interruptions, the peaceful relations between the Goths and the Romans continued for more than a hundred years. During this period the old names Visigoth and Ostrogoth received a new sense as expressive of a national distinction. The Visigoths or Thervings of later history are the descendants of the people established by Aurelian in Dacia; the Ostrogoths or Greuthungs are the descendants of the Goths who remained in southern Russia.

In the 4th and succeeding centuries writers who affected classicality of diction frequently applied to the Goths the obsolete names of Getæ and Scythians, which in antiquity belonged to the inhabitants of the regions in which the Goths were now settled. Usually the Goths were regarded as the actual descendants of these historic peoples, and the name *Gothi* seems to have been imagined to be a corruption of *Getæ*. In the 6th century Cassiodorus, followed by the Goth Jordanis, endeavoured to blend into one story the facts of Getic history, taken from Herodotus and other classical writers, and the Gothic traditions of a migration from the extreme north. In modern times the hypothesis of the identity of Goths and Getæ has been advocated by so distinguished a scholar as Jacob Grimm, but is now generally rejected.

In the middle of the 4th century the Ostrogothic king Ermanaric established by conquest a powerful empire, extending from the Black Sea to the Gulf of Bothnia. About the year 375 this empire was subjugated by the Huns. The Visigoths, with a small portion of the Ostrogoths, escaped a similar fate by crossing the Danube, and placing themselves under the protection of the Roman empire. The oppression of the provincial governors soon provoked a revolt. The eastern emperor, Valens, collected a great army and marched into Thrace for the purpose of subduing the barbarians; but at the battle of Adrianople (August 9, 378) the Romans suffered a ruinous defeat, and Valens himself was killed. The Goths, however, were too ill organised to make effective use of their victory, and Theodosius, the successor of Valens in the empire of the East, and afterwards sole sovereign of the Roman empire, found it possible in a few years to bring back to their allegiance the whole Gothic people, excepting those who were under the yoke of the Huns. This result was not attained without great and dangerous concessions. The Visigoths received large grants of land in Thrace, and the Ostrogoths in Phrygia. They were permitted to govern themselves by their own laws, and 40,000 of their warriors were embodied into a separate army (called *fœderati*), receiving a high rate of pay. Many of their nobles also were promoted to high positions in the imperial service. So long as Theodosius lived these measures were successful in securing the loyalty of the Goths; but the excessive favour shown to barbarians who had so lately been enemies provoked serious discontent.

The Goths thus incorporated into the Roman empire had for the most part been converted to Christianity; principally, it is believed, owing to the labours of the Arian bishop Wulfila or Ulphilas (q.v.), a Goth who had received a learned education at Constantinople, and who lived as a missionary among the Visigoths from 340 to 381. The new faith was with extraordinary rapidity accepted, not only by the two great branches of the Gothic people, but by all the smaller nations of kindred race. For two hundred years the Goths remained faithful to the Arian creed taught by Wulfila and his disciples. Unlike the Vandals, who were adherents of the same sect, the Arian Goths were honourably distinguished by their freedom from bigotry. Although themselves the object of the most virulent religious hatred, they were, even at the height of their power, very seldom guilty of persecution.

On the death of Theodosius in 395 the sovereignty of the Roman world was divided between his two sons, Arcadius becoming emperor of the East, and Honorius emperor of the West. One of the first acts of the ministers of Arcadius was to lower the pay of the Gothic soldiery. The Visigoths at once rose in rebellion, and, electing as their king a young officer of distinction named Alaric (q.v.), proceeded to overrun Greece. The emperor was compelled to make terms: Alaric was made military governor of Eastern Illyricum, and remained quiet for three years, preparing for an irruption into Italy. In the year 400 he entered the peninsula, but apparently met with no great success. After being defeated by Stilicho at Pollentia (Easter Sunday, 402), he retired to Illyria, receiving, however, a large sum of money from the Romans as the price of peace. A second invasion in 408, provoked by the

disregard of treaty obligations on the part of the Romans, had very different results. Stilicho was dead, and the barbarian soldiers of Italy, exasperated by official tyranny, deserted to the standard of Alaric in great numbers. Rome was thrice besieged; twice the city was saved by the submission of the senate, but on the third occasion it was taken by storm and delivered up to plunder. Although terrible excesses were committed by the Goths, the Roman writers speak with great admiration of the humanity and moderation displayed by Alaric himself. Honorius, secure in the impregnable fortress of Ravenna, and encouraged by hopes of support from Constantinople, refused to come to terms, and Alaric was preparing to effect the entire subjugation of Italy, when his career was cut short by death in 410.

Alaric's successor, Atawulf, abandoned the design of conquering Italy, and led his people into southern Gaul. At Narbonne he married the daughter of Theodosius, the princess Galla Placidia, who had been taken captive by Alaric in Rome. On the approach of a Roman army under Constantius the Visigoths crossed the Pyrenees into Spain, where Atawulf was murdered in 415.

The next king, Wallia, submitted to the Romans, and in the name of the empire conquered nearly the whole of Spain. As the reward of his services, he received permission to settle with his people in the south of Gaul.

The 'kingdom of Toulouse,' founded by Wallia in 418, was increased by the conquests of his successors, until under Euric (who died in 485) it included the whole of Gaul south of the Loire and west of the Rhone, as well as Provence and the greater part of Spain. The most noteworthy event in the history of this kingdom was the great battle fought in 451 on the Mauriac plains near Troyes (commonly miscalled the battle of Chalons), in which the Visigoths under their king Theoderic (or Theoderid) I., united with the Romans and the Franks, inflicted a crushing defeat on the vast army of the Huns under Attila (q.v.). Theoderic was killed, but the result of the battle was the dissolution of the Hunnish empire, and the salvation of European civilisation from the deluge of barbarism which had threatened to overwhelm it.

In the reign of Alaric II., the successor of Euric, the kingdom of Toulouse came to an end. The Frankish king Clovis (Chlodovech, Hlôdawîh), whose recent conversion to Catholic Christianity enabled him to give to a war of unprovoked aggression the specious aspect of a crusade against the heretics, invaded the Visigoth territories in 507. The battle fought on the 'field of Voclad,' near Poitiers, decided the sovereignty of Gaul. Alaric was killed, and the Visigoths abandoned to the conqueror all their territories north of the Pyrenees, retaining of their Gaulish possessions only a small strip of country bordering on the Gulf of Lyons. The subsequent history of the Visigoths must be reserved until we have related the history of their Ostrogothic kinsmen.

After their subjugation by the Huns in the later part of the 4th century, the Ostrogoths, Gepidæ, and the smaller 'Gothic' peoples appear to have adopted the nomad life of their conquerors, and they formed part of the vast horde which followed Attila into Gaul. On the collapse of the Hunnish dominion these nations regained their independence. The Ostrogoths settled first in the neighbourhood of Vienna, under their king Walamer, a member of the Amaling family, who traced their descent through Ermanaric and Ostrogotha to a legendary hero named Amala. Immediately after their emancipation the Ostrogoths are found occupying the position of mercenaries of the Eastern Empire. In 462 the friendly relations between Walamer and the emperor, which had been for a time relinquished, were renewed, and Walamer's nephew, Theoderic, the son of Theodemer, a boy eight years old, was sent as a hostage to Constantinople, where he remained ten years, receiving the education of a Roman noble. Shortly after his return the Ostrogoths, pressed by famine, abandoned their homes, and migrated in a body towards the south-east. Their inroads in Mœsia and Thrace caused great alarm at Constantinople, and the emperor was constrained to purchase peace by granting them permission to settle in Macedonia, and by bestowing on them large gifts of land and money.

In 474 the young Theoderic became king of the Ostrogoths. After fourteen years spent in petty warfare, sometimes as the ally and sometimes as the enemy of the Romans, he obtained from the Emperor Zeno permission to wrest the dominion of Italy from the usurper Odovacar (Odoacer, q.v.). Like most of the military expeditions of the Goths, the invasion of Italy was the emigration of an entire people; and the number of persons who accompanied the march of Theoderic was probably not less than a quarter of a million. After a war of five years the work of conquest was completed by the capture of Ravenna and the submission of Odovacar, who, it is said, was soon afterwards brutally and treacherously murdered by Theoderic's own hand.

Notwithstanding this evil beginning, the thirty-three years' reign of Theoderic in Italy was one of singular humanity and wisdom, and secured for the country a degree of tranquillity and prosperity such as it had not enjoyed for centuries. The historian Procopius, though a Byzantine courtier, pronounces him not inferior to the best and wisest of Roman emperors. The partisans of Odovacar received a general amnesty; the necessary provision of lands for the Goths was carefully carried out so as to press as lightly as possible on the native population; the fiscal and judicial systems were reorganised, and all acts of extortion or injustice on the part of officials were sternly repressed. The Goths and the Romans continued to be distinct nations, each judged by its own tribunals and by its own laws, limited and supplemented by a new code containing a few provisions which were made binding on all the subjects of the kingdom. The Catholics were granted entire equality with the adherents of the king's own faith; the Jews, in all other Christian lands the victims of oppression, enjoyed under Theoderic full liberty of worship, and protection from all encroachment on their civil rights. It is impossible to read the official letters written in Theoderic's name by his Roman secretary, Cassiodorus, without the deepest admiration for the king's unwearied energy and enlightened zeal for the welfare of his subjects. It is true that in the last three years of his life, when he was worn by age and harassed by suspicions of widespread treason, his fame was tarnished by the judicial murders of Boethius and Symmachus, and by acts of oppression directed against the Catholic Church. But there have been few possessors of absolute power who, on the whole, have used it so nobly.

Theoderic died in 526, and his daughter Amalaswintha was appointed regent on behalf of her son Athalaric, then ten years old. When Athalaric died at the age of sixteen, Amalaswintha associated with herself in the kingdom her father's nephew, the base and cowardly Theodahad, by whose orders she was soon afterwards murdered. Theoderic had not long been dead before the disordered state of the kingdom testified to the incapacity of his successors; and the Ostrogothic power was threatened by a new danger in the ambition of the Emperor Justinian, who, not content

with the formal acknowledgement of supremacy which had satisfied his predecessors, was resolved to make Italy an integral part of his own dominions. In 536 the great general Belisarius was sent for the purpose of conquering the country. The Goths deposed Theodahad, and elected to the throne a distinguished soldier named Witigis, who, on his elevation, married Amalaswintha's daughter Mataswintha. After four years Belisarius, though enormously overmatched in numbers, had subdued all but the extreme north of Italy, and held Witigis and his queen prisoners, when he was recalled by Justinian's jealousy to Constantinople.

Soon after his return the oppression of the imperial representatives in Italy not only provoked into revolt the Goths who had submitted to Roman rule, but excited mutiny among the Roman soldiers, who deserted to the enemy in great numbers. In a few months the new king of the Goths, Hildibad, who had previously maintained a precarious footing in the north, found himself at the head of a powerful army. His career, however, was cut short by assassination; and after a short interregnum the Goths conferred the crown on his nephew Totila, otherwise named Badwila. After a struggle of a few years, in which Totila displayed not only brilliant military talent, but a chivalrous generosity and humanity which extorted the admiration of his enemies, the imperial cause in Italy was felt to be desperate, and in 544 Belisarius was again sent to take the command of the army. But owing to the insubordination of his officers, and to other causes, he had little success, and after five years was recalled at his own request. The enterprise in which Belisarius had failed was accomplished by the aged eunuch Narses, who, in 552, landed in Italy at the head of a colossal army. The Ostrogoths suffered a crushing defeat at Taginæ (Tadino), where Totila was killed. His successor, Teia, fell a few months later in the battle of Mons Lactarius, near Vesuvius. The remnant of the defeated army was suffered by Narses to march unmolested out of Italy; their subsequent fate is unknown. In the course of the next two years the few outstanding Gothic garrisons surrendered, and Italy became a portion of the Byzantine empire. The nation of the Ostrogoths had ceased to exist.

We now return to the history of the Visigoths. The conquering progress of Clovis, after the battle of Voclad in 507, was checked by the armed intervention of Theoderic the Ostrogoth, who compelled the Franks to leave the Visigoths in possession not only of their Spanish dominions, but also of a small tract of country in Gaul, including the cities of Carcassonne, Narbonne, and Nimes. The former Visigothic territories in Provence Theoderic annexed to his own kingdom, and he assumed the guardianship of his infant grandson Amalaric, the son of Alaric II. During Theoderic's life the Visigothic kingdom was administered by him in the name of Amalaric; in Spain, however, his general Theudis practically reigned as a tributary king. After Theoderic's death Amalaric was acknowledged as sovereign of the Visigoths, but his direct rule was confined to the Gaulish dominions, Theudis still retaining the real authority in Spain. A defeat by the Franks having caused Amalaric to cross the Pyrenees, he was murdered in 531 by order of Theudis, who then assumed the crown, and reigned till he died by an assassin's hand in 548. The Visigothic state now became what it had been prior to 419, a purely elective monarchy, and the choice of the kings was frequently attended by civil war. Athanagild, who was placed on the throne by a rebellion in which he was aided by an army from Justinian, reigned prosperously for fourteen years (554–567); but his Byzantine allies (the 'Greeks,' as they were called) seized several of the Spanish cities, and were not completely dislodged until about 625.

The brilliant reign of Leovigild, who made Toledo the capital of the kingdom, was marked by the subjugation of the Suevic kingdom in northwestern Spain and Portugal. In 572 Leovigild associated with himself in the kingdom his two sons, Ermenegild and Reccared. The former, a convert to Catholicism, rebelled against his father, but after two years was conquered, and afterwards put to death. It is said that he was offered his life and restoration to his royal dignity if he would return to the Arian faith. By the Catholic Church he was reverenced as a martyr, and was formally canonised by Pope Sixtus V.

On the death of Leovigild his son Reccared, already a crowned king, succeeded without the formality of election. One of his first acts was to announce his determination to adopt and to establish the Catholic religion. The Goths, who were evidently weary of their position of ecclesiastical isolation, and had lost interest in their hereditary creed, accepted the change with surprising readiness. Revolts took place in Gaul and in the former Suevic kingdom, but these were soon suppressed; and the Arian clergy and laity were in overwhelming numbers admitted into the Catholic Church.

The conversion of the Visigoths was a political necessity. The secure establishment of their dominion was impossible so long as they were divided from the subject people by religious differences, and had against them the powerful organisation of the Spanish Church. This formidable adversary was now converted into an ally; but unhappily the weakness of the monarchy enabled the church to exact ruinously great concessions as the price of its support. In the course of the 7th century the Visigothic state became gradually more and more subservient to the church. The kings were elected by an assembly of bishops and court officials, the former often being in a large majority. The three sovereigns who succeeded for a time in vindicating their independence—Swinthila (620–631), Kindaswinth (641–649), and Wamba (672–680)—were eventually either deposed or induced to abdicate; and in the next reign the ground lost by the church was always more than regained. It is hardly too much to say that under the more ecclesiastically-minded kings the country was governed mainly in the interests of the clerical order; and on the whole the influence of the priesthood was so exercised as to foster, instead of to check, the many causes of decay and disorganisation which brought about the ruin of the kingdom. The efforts of Witica (701–710) to carry out extensive reforms in church and state were indeed seconded by the Archbishop of Toledo, but were virulently opposed by the great body of the clergy. Of his successor, Roderic, 'the last of the Goths,' legend has a great deal to say, but history knows only that his defeat on the banks of the Guadalete (August 711) placed the dominion of Spain in the hands of the Moorish invaders. Under the pressure of the Moslem yoke the Christians of the Peninsula became united into one nation, and the Goths ceased to exist as a separate people; but the Spanish nobility have always laid claim to Gothic descent.

The last portion of the Gothic race to disappear as a distinct community was that branch of the Ostrogoths (known in the 6th century as *Tetraxitæ*) who inhabited the Crimea from the time of Ermanaric. In the reign of Justinian these Goths received a Catholic bishop from Constantinople, and in the official language of the Eastern Church 'Gothia' continued to be the name of the Crimea

down to the 18th century. In 1562 the famous traveller Busbecq met at Constantinople with two Crimean envoys, and wrote down a long list of words of their language, which he recognised as having an affinity with his native Flemish. The words are for the most part unquestionably Gothic. It is possible that in the Crimea the Gothic speech may have survived to a much later time; in 1750 the Jesuit Mondorf learned from a native of that region, whom he had ransomed from the Turkish galleys, that his countrymen spoke a language having some resemblance to German.

The Gothic language is now classed by philologists as belonging, together with the Scandinavian dialect, to the 'East Germanic' group, so called in contradistinction to the 'West Germanic,' which includes Old English and Low and High German. In some of its features the East Germanic form of Teutonic speech is more primitive than the other branch—e.g. in the preservation of the inflexional final *-z* (becoming in Gothic *s* and in Old Norse *r*), which in West Germanic is lost. On the other hand, there are certain features (such as the substitution of *-aggw-*, *-iggw-*, for the original *-anw-*, *-inw-*) in which the eastern branch shows a later stage of development. As the Bible translated by Wulfila is several centuries older than the earliest written remains of any other Teutonic language, the value of Gothic in the study of Teutonic philology is very great, although the mistaken notion that it represents substantially the ancestral form of the Teutonic languages as a whole led the scholars of an earlier generation into many errors which are still often repeated in popular handbooks. The Gothic written character, believed to be the invention of Wulfila, is substantially an adoption of the ordinary Greek alphabet of the 4th century, some letters, however, being taken from the Latin, and others from the Runic alphabet used by the Goths before their conversion. The most scientific grammar of the language is that of W. Braune (Eng. trans. 1883); Douse's *Introduction to the Gothic of Ulphilas* (1886) is also valuable. The most complete dictionary is still that of Schulze (Magdeburg, 1848), which gives full references to the passages in which the words occur, and also the Greek words which they render in Wulfila's translation. It should, however, be checked by comparison with later works—e.g. with Schulze's abridgment of 1867, or the concise dictionaries of Heyne and Bernhardt. A useful vocabulary, with an outline of the grammar, has been published by Professor Skeat (1868).

The scanty written remains of the Gothic language are scarcely entitled to the name of literature. Wulfila's translation of the Bible, however, is a work of extraordinary ability, and from its early date and its extreme faithfulness is of some value for the textual criticism of the New Testament. The extant portions comprise the greater part of the four gospels, parts of St Paul's epistles, and some verses of Ezra and Nehemiah. The remaining Gothic writings are a portion of a commentary on the gospel of St John, two title-deeds referring to property at Ravenna and at Arezzo, and a fragment of a Gothic calendar. All the existing Gothic MSS. seem to have been written in Italy in the first half of the 6th century. The most important of these, the beautiful *Codex Argenteus* of the gospels, was discovered in the 16th century in the monastery of Werden in Westphalia, and is now at Upsala. Of Gothic inscriptions in the Runic character only three are known, all probably belonging to the 4th century; two of them are merely men's names (Tilarids, Ranya) scratched on spear-heads, and the third consists of the words *Gutani ƕi* (or *ƕkwi*) *hailag*, 'the holy . . . of the Goths,' on a gold necklet found in 1838 at Petrossa in Wallachia. See Henry Bradley, *The Goths, to the end of the Dominion in Spain* ('Story of the Nations' series, 1888).

Götterdämmerung. See RAGNAROK.

Gottfried von Strasburg, a famous mediæval German poet, who flourished about the close of the 12th and the beginning of the 13th century, contemporary with Hartmann von Aue, whom he celebrates as the first of German narrators, Wolfram von Eschenbach, to the prologue of whose *Parzival* he alludes, and Walter von der Vogelweide. Gottfried's poem, *Tristan und Isolde*, extends to 19,552 short rhymed lines, but was left unfinished, and ends abruptly. It was completed about 1210, and he himself died between that year and 1220. The story itself is of course of Celtic origin; and there is hardly another theme that has laid such a potent spell upon the imagination of poets in every age. Gottfried's immediate source was a poem of the French trouvère Thomas, of which only fragments now exist; but in his hands the theme has been treated with a new poetic vigour and mastery at once of pathos and of passion. Gottfried's works, with later continuations of *Tristan* by Ulrich von Turheim and Heinrich von Freiberg, were published by Fr. Heinrich von der Hagen (1823). The best edition is that of Bechstein (2d ed. 1873). Modern German translations have been given by Kurtz (1844), Simrock (1885), and Wilh. Hertz (1877). Wagner has made use of *Tristan* for his opera *Tristan und Isolde*. See works by Franck (1865) and Golther (1887).

Gotthelf. See BITZIUS.

Göttingen (10th century *Gutingi*), a town in the former kingdom of Hanover, lies 538 feet above sea-level in the Leine's wide valley, encircled by gentle hills—the highest, the Hainberg (1246 feet). By rail it is 67 miles S. of Hanover, and 36 NE. of Cassel. The ramparts, long since outgrown, and now planted with lindens, form a charming promenade; but architecturally Göttingen has nothing much to boast of—a quaint *rathhaus*, a statue of William IV., and a few antique buildings, one of which, the Jacobikirche, has a steeple 320 feet high. The celebrated university (*Georgia Augusta*) was founded 1734–37 by Baron Münchhausen, under the auspices of George II., Elector of Hanover and king of England, and now has 120 professors of various grades, and more than 1000 students of philosophy, theology, medicine, and jurisprudence. Connected with it are the library of 500,000 volumes and 5000 MSS., the art museum, the splendid botanic garden (laid out by Haller), the observatory, the laboratory, the lying-in hospital, &c., as also the Royal Society (1750) which publishes the well-known Transactions and the *Gottinger Gelehrte Anzeigen*. Longfellow, Motley, Ticknor, Bancroft, and several other illustrious Americans studied at Göttingen, whose native *alumni* include many of Germany's most famous sons. The 'Göttinger Dichterbund' was a small poet band (Voss, the two Stolbergs, Klopstock, Bürger, &c.) who, in the 'Storm and Stress' days of 1770–78 did much for the revival of national feeling; by the 'Göttinger Sieben' are meant the seven professors (Albrecht, Dahlmann, Ewald, Gervinus, the two Grimms, and Weber) who for their liberal tendencies were in 1837 expelled by King Ernest Augustus. The book-trade is of more importance than the manufactures—woollens, sugar, chemicals, &c. Pop. (1875) 17,057; (1885) 21,598, of whom 1714 were Catholics, and 536 Jews. Raised to a town in 1210, and a considerable member of the Hanse in the 14th century, Göttingen suffered much during the Thirty Years' War, when it was taken by Tilly in 1626, and recaptured by the

Swedes in 1632. See works by Frensdorff (1878) and Hasselblatt (1881).

Gottschalk, a monk of Fulda, studied Augustine's works in the monastery at Orbais in the diocese of Soissons, and adopted such strong views on Predestination (q.v.) that Rabanus (q.v.), Archbishop of Mainz, had him condemned as a heretic in 848. His own archbishop, Hincmar (q.v.) of Rheims, deposed and imprisoned him; and though Gottschalk recanted under the lash, he died in prison 868.

Gottschall, Rudolf von, poet and novelist, born at Breslau 30th September 1823, made his début with poems in 1842. Successful plays were *Pitt und Fox* and *Lambertine von Mericourt*. *Die Göttin* (1853) and *Carlo Zeno* (1854) were epic poems. *Die Deutsche Nationalliteratur des 19ten Jahrhunderts* (4 vols. 1855–92) and *Poetik* (6th ed. 1893), are his most important books on the history of literature. His dramatic works (including *Catharine Howard*, *Amy Robsart*, and *Arabella Stuart*) fill 12 volumes; his novels (including *Withered Leaves*, translated 1879) are numerous, as also essays published in *Unsere Zeit* and other magazines edited by him; and he published several records of travel (Italy, Paris, &c.). He was ennobled in 1877.

Gottsched, Johann Christoph, an important figure in the history of German literature, was born at Judithenkirch, near Königsberg, in Prussia, February 2, 1700. At the university of Königsberg he studied philosophy, belles-lettres, and languages. In 1724 he removed to Leipzig, where in 1730 he became professor of Philosophy and Poetry, and in 1734 professor of Logic and Metaphysics. He died 12th December 1766. Between 1729 and 1740 Gottsched exercised a sort of Johnsonian dictatorship in the world of polite literature in Germany. At first he laid down, in various periodicals which he edited, rules and theories for the composition of poetry, and sharply criticised the bombastic absurdities of the Silesian school of poets. At the same time he laboured, to the best of his abilities, to improve his mother-tongue as a literary vehicle, by aiming at greater polish, formal completeness, and elegance. But his chief endeavours were directed to the reformation of the German drama, a work in which, in co-operation with the Neubers, he did indeed effect a very meritorious alteration, in that he raised the moral tone, the literary workmanship, and the taste of the acting plays, banished the coarse buffooneries of Hanswurst ('Jack Pudding') from the boards, and recommended as models the best class of French theatrical pieces. But his reforming zeal carried him too far, and brought him on to the dangerous ground of excess. He became pedantic and vain; his critical faculty became distorted; he manifested a petty jealousy of all literary authority save his own, opposing himself to the Swiss writers Bodmer and Breitinger, and refusing to see any merit in Klopstock and Lessing. His own model drama, *The Dying Cato* (1732), notwithstanding its immense success, is sadly barren of poetry and dramatic action. He did, however, leave one useful work, *Nothiger Vorrath zur Geschichte der Deutschen dramatischen Dichtkunst* (1757–65), an unfinished catalogue of plays from 1450 to 1760. See Danzel, *Gottsched und seine Zeit* (1848); and Bernays, *Goethe und Gottsched, zwei Biographien* (1880).

Götz von Berlichingen, 'of the Iron Hand,' a German knight of the 16th century, was born at Jaxthausen, in Würtemberg, in 1480. (Götz is an abbreviation of Gottfried.) His education was conducted by his uncle Conrad, with whom he attended the diet of Worms in 1495. From 1497 onwards to 1525 his restless spirit, and the general turbulence of the time, involved him in continual feuds, in which he displayed a mixture of lawless daring and chivalrous magnanimity. At the siege of Landshut (1505) he lost his right hand, which was replaced by an artificial one of steel, cunningly invented by himself; it is still shown at Jagstfeld. Twice he was declared under the ban of the empire for acts which were little better than acts of brigandage or highway robbery—in 1512 for plundering a band of Nuremberg merchants, and in 1516 for carrying off Count Philip of Waldeck and extorting a large ransom for his liberation. Having joined Duke Ulrich of Würtemberg when this prince was attacked (1519) by the Swabian league, Götz, after making an heroic defence of Möckmühl, was, contrary to the articles of his capitulation, taken prisoner, and only released at the intercession of his friends, George von Frundsberg and Franz von Sickingen, on payment of 2000 florins ransom. In the Peasants' War of 1525 he took part with the insurgents and was chosen leader of a part of their forces. This step he ascribes to compulsion; more likely it was the result of his own restless and turbulent spirit, and of a desire for revenge on his old enemies of the Swabian league. Although acquitted of blame for his participation in this affair by the supreme court of the empire, he was nevertheless captured by his enemies of the Swabian league, kept a prisoner at Augsburg for a couple of years, and at last sentenced to perpetual imprisonment in his own castle, and, in case of his breaking this condition, to a fine of 20,000 florins. He was only freed from this irksome bondage on the dissolution of the league in 1540. Two years later he was again in action, fighting with the emperor in Hungary against the Turks, and two years later still in France. He died July 23, 1562, in his castle at Hornberg on the Neckar. He wrote an account of his own life, published by Pistorius (Nürn. 1731; Bresl. 1813), which furnishes an excellent picture of the social life and manners of the period, and on which Goethe grounded his drama of *Goetz von Berlichingen*, translated by Sir Walter Scott.

Gouda (Dutch *Ter Gouwe*), a town of South Holland, on the right bank of the Hollaendsche Yssel, 13 miles by rail NE. of Rotterdam. The church of St John has a suite of magnificent stained-glass windows (1560–1603) by the brothers Crabeth and a fine organ. Gouda makes clay-pipes, candles, cigars, and trades in Gouda cheese. Pop. 20,100.

Goudimel, Claude, composer, born at Besançon in 1505, taught music at Rome, composed masses, motets, chansons, harmonised Marot's psalms, and perished at Lyons as a Huguenot, 29th August 1572 (just after St Bartholomew).

Gough, Hugh Gough, Viscount, born at Woodstown in Limerick 3d November 1779, served at the Cape, in the West Indies, and through the Peninsular war, especially distinguishing himself at Talavera and Vittoria. In 1837 he went to India as major-general, and in the following year was made commander-in-chief of the forces sent against China. After storming Canton and forcing the passage of the Yang-tsze-Kiang, he compelled the Chinese to sign the treaty of Nanking (1842). In 1843 he defeated the Mahrattas at Maharajpur, and brought about the peace of Gwalior. On the outbreak of the Sikh war in 1845 he worsted the enemy in the brilliant battles of Mudki, Firozshah, and Sobraon, for which he was given a peerage. In 1848 the Sikhs renewed the war, but were again defeated by Gough at Ramnagar, Chillianwalla, and Gujerat, victories which resulted in the annexation of the Punjab to British India. Gough was in 1849 created a viscount, and about the same time returned to England. He was made field-marshal in 1862, and died near Dublin, 2d March 1869.

Gough, JOHN BARTHOLOMEW, temperance lecturer, was born at Sandgate, Kent, August 22, 1817; his father was a pensioner of the Peninsular war, his mother a village schoolmistress. At the age of twelve he was sent to America, and worked on a farm in Oneida county, New York. In 1831 he went to New York city, where he found employment in the binding department of the Methodist book establishment; but habits of dissipation lost him this employment, and reduced him to that of giving recitations and singing comic songs at low grog-shops. He was married in 1839; but his drunken habits reduced him to poverty and delirium tremens, and probably caused the death of his wife and child. In 1842 a benevolent Quaker induced him to attend a temperance meeting and take the pledge; and soon afterwards, resolving to devote the remainder of his life to the cause of temperance, Gough attended temperance meetings and related his experience with such effect as to influence many others. A few months later he had a short relapse into drunkenness; but an eloquent confession restored him to favour, and he lectured with great pathos, humour, and earnestness in various parts of America. In 1853 he was engaged by the London Temperance League, and lectured for two years in the United Kingdom, where he attracted large crowds to his meetings. He was again in England in 1857–60 and 1878. In some of his later addresses he took up literary and social topics, and acquired a moderate fortune by his lectures. He died at Frankford, Pennsylvania, February 18, 1886. He published an *Autobiography* (1846); *Orations* (1854); *Temperance Address* (1870); *Temperance Lectures* (1879); and *Sunlight and Shadow, or Gleanings from my Life-work* (1880).

Gough, RICHARD, English antiquary, was born in London, 21st October 1735. On leaving Benet (now Corpus Christi) College, Cambridge, in 1756, he began work as a professed antiquarian by a visit to Peterborough and Crowland, and continued to make similar excursions down to 1771. Two years later he commenced the preparation of an English version of Camden's *Britannia*, which was issued in 1789. But three years previously he had published his important *Sepulchral Monuments of Great Britain*, which was brought down only to the end of the 15th century. Amongst numerous minor works from Gough's pen was a *History of the Society of Antiquaries of London* (1770). He died at Enfield, in Middlesex, 20th February 1809.

Goujon, JEAN, the most skilful sculptor of France during the 16th century. The date and place of his birth are not known. The finest productions of his chisel are a figure of 'Diana reclining by a Stag,' now in the Louvre, a remarkably vigorous and graceful work; the reliefs for ornamenting the Fountain of the Innocents, also in the Louvre; the sepulchral monument to the Duke of Breze, in Rouen Cathedral if it is by him executed some time between 1540 and 1552; and several reliefs in the Louvre, where Goujon worked from 1555 to 1562, especially four Caryatides. He was a Huguenot, but seems to have died before the Bartholomew massacre in 1572.

Goulburn, a town of New South Wales, 134 miles SW. of Sydney by rail, with several tanneries, boot and shoe factories, flour-mills, and breweries, and a busy trade in agricultural produce. It is a substantially built town, with gas (1879) and a good supply of water. The seat of an Anglican and of a Roman Catholic bishop, it contains a handsome Church of England cathedral (Gothic, consecrated in 1884) and a Roman Catholic cathedral. It has also a Catholic college and a convent. Pop. 10,916.

Goulburn, EDWARD MEYRICK, D.D., son of Edward Goulburn, serjeant-at-law, was born 1818. He was educated at Eton and Balliol College, Oxford, where he graduated in 1839, and in 1841 was elected a Fellow of Merton. After holding the Oxford incumbency of Holywell, he became head-master of Rugby (1850–58), in succession to Dr Tait. He next became prebendary of St Paul's (1858); chaplain to the Queen, and vicar of St John's, Paddington (1859); and Dean of Norwich (1866), which office he resigned in 1889. In 1872 he led the opposition to Dean Stanley's proposal to make subscription to the Athanasian Creed permissive in the case of ordination. Among his publications are *The Philosophy of Grammar* (1852), *Thoughts on Personal Religion* (1862), and *The Office of the Holy Communion* (1863). He died 3d May 1897. See Life by Berdmore Compton (1899).

Gould. See BARING-GOULD.

Gould, BENJAMIN APTHORP, astronomer, was born in Boston, Massachusetts, 27th September 1824, graduated at Harvard in 1844, and received the degree of Ph.D. at Göttingen in 1848. He conducted the *Astronomical Journal* from 1849 to 1861, was director of the Dudley Observatory at Albany in 1856–59, and in 1866 determined by aid of the submarine cable the difference in longitude between Europe and America. In charge, from 1868, of the national observatory at Cordoba in the Argentine Republic, he organised a series of stations throughout the country, and mapped a large part of the southern heavens: his *Uranometry of the Southern Heavens* did for the southern hemisphere what Argelander's *Atlas* did for the northern. After his return he received the degree of LL.D. from Harvard (1885) and from Columbia (1887). He published valuable astronomical reports and charts, and was a member of numerous scientific societies in Europe. His death, 27th November 1896, was brought about by a fall downstairs.

Gould, JAY, American financier, was born, the son of a farmer, at Roxbury, New York, 27th May 1836. He made a survey of parts of the state, engaged for a short period in lumbering, and accumulated enough capital to become in 1857 the principal shareholder in the bank of Stroudsburg, Pennsylvania. He now began to buy up railroad bonds, and in 1859 established himself as a broker in New York city. He was president of the Erie railway company till 1872, and afterwards invested largely in the stocks of other railways and telegraph companies. In 1882, a question of his commercial stability having arisen, he took the effective step of producing stock certificates having a face value of $53,000,000, and offered to produce $20,000,000 more; in 1887 it was estimated that he controlled over 13,000 miles of railway. He died unlamented, 2d December 1892, worth some $50,000,000.

Gould, JOHN, ornithologist, born at Lyme, Dorsetshire, in 1804. Removing in early life to the neighbourhood of Windsor, where his father was foreman in the Royal Gardens, his ruling passion soon showed itself. He became curator to the Zoological Society's Museum in 1827, when the friendship of Mr N. A. Vigors encouraged him in the production of the first of the large illustrated folios the publication of which from time to time established his reputation. This was a *Century of Birds from the Himalaya Mountains* (1832), the plates being drawn and coloured by his wife. Next after this followed *Monograph of the Ramphastidæ* (Toucans) (1834), *Icones Avium* (1837), *Birds of Europe* (1832–37), and *Monograph of the Trogonidæ* (1838). Assistance was now granted him to proceed to Australia in order to study its natural history; the results of his investigations appeared

in *Birds of Australia* (7 vols. 1840–48), *Mammals of Australia* (1845), and *Family of Kangaroos* (1841–42). His *Monograph of the Odontophorinæ* (American Partridges) appeared in 1844–46, and his *Humming Birds* in 1849. He took immense pains with the illustrations to the latter, the humming-birds, of which he had a splendid collection on view at the Exhibition of 1851, being great favourites with him. Gould's other great works, several of which were left unfinished, were *Birds of Great Britain* (1862), *Birds of Asia*, and *Birds of New Guinea*. Gould, who was a Fellow of the Zoological Society, and contributed largely to its *Proceedings*, helped to prepare the department 'Birds' in the *Zoology of the Voyage of the Beagle*, was a keen sportsman, an accurate observer, and a patient and successful labourer in his chosen field of study. He died 3d February 1881. See *Westminster Review*, 1841, and *Nature*, 1881; and the elaborate *Analytical Index* to his works by R. Bowdler Sharpe (1893).

Gounod, CHARLES FRANÇOIS, an eminent French composer, was born in Paris, 17th June 1818, and studied at the Conservatoire under Halévy, Lesueur, and Paer. Obtaining the first prize in 1839, he was sent to Rome to complete his musical education, and while there devoted himself chiefly to religious music. On his return to Paris he was for a time attached to the church of the Missions Etrangères, where his earliest compositions were performed; one of them, a *Messe Solennelle*, was the first work which brought him into general notice. For a time he contemplated taking orders, and went through part of the preliminary novitiate. His first opera, *Sappho*, was produced in 1851; in 1852 he wrote choruses for Ponsard's drama of *Ulysse;* and in 1854 appeared his opera of *La Nonne Sanglante*. His comic opera, *Le Médecin malgré lui* (1858), was a great success; it was followed in 1859 by *Faust*, which at once attained European popularity, and raised its composer to the foremost rank of contemporary musicians. *Philémon et Baucis* followed in 1860; in 1862, *La Reine de Saba* (brought out afterwards in England as *Irene*); in 1864, *Mireille;* in 1867, *Roméo et Juliette;* in 1878, *Polyeucte;* in 1881, *Le Tribut de Zamora*. He also published much church music, including several masses, hymns, and motets or anthems, and was extensively popular as a song-writer. His oratorio, *The Redemption*, produced at the Birmingham Festival in 1882, and deemed by the composer his masterpiece, has achieved great popularity in Britain, though less esteemed abroad; its sequel, *Mors et Vita*, written for and produced at the succeeding Festival in 1885, has not gained equal approval. From 1870 to 1875 he resided in England, where his works are as much admired as in his own country, his sacred music probably even more. A master of the orchestra, he was the originator of new and impressive combinations. His dramatical faculty is often dominated by the lyric element; he exhibits a singular combination of the mystic and the voluptuous—e.g. sensuous melodies with solemn religious harmonies. *Faust* is generally regarded as his most enduring work. A member of the Institute (1866) and a Commander of the Legion of Honour (1877), he died 18th October 1893. See works by Pagnerre (1890) and Marie Anne de Bovet (1891).

Goura, a genus of beautifully crested ground-loving pigeons, including the largest and perhaps finest members of the family. They inhabit New Guinea and adjacent islands, where they are fond of walking in pheasant-like fashion along the forest paths. They nest on trees and feed on fruits. The first known species, *G. coronatus*, is a beautiful bird over two feet in total length, with the characteristic fan-like crest on the head. It is sometimes kept among poultry, and its flesh is much esteemed.

Gourd (*Cucurbita*), a genus of plants of the natural order Cucurbitaceæ, nearly allied to the cucumber, having male and female flowers on the same plant, the flowers large and yellow. The species are annual plants of very rapid growth, their leaves and stems rough, their leaves broad and lobed, their stems often very long and trailing; they are natives of warm climates, although the native region of the kinds chiefly cultivated is very uncertain, and they have probably been greatly modified by long cultivation, so that perhaps all of them may be forms of one original species, a native of some of the warmer parts of Asia. The Common Gourd or Pumpkin, *Citrouille* of the French (*C. pepo*), with smooth globose or pear-shaped fruit, varying from the size of a large apple to 50 or 100 lb. in weight, is much cultivated both in gardens and fields in almost all parts of the world of which the climate is warm enough for it; and the fruit is not only a very important article of human food, but is also used along with the superabundant shoots for feeding cattle. In many countries pumpkins are a principal part of the ordinary food of the poorer classes, and are much used even by the wealthy; they are not eaten raw, but dressed in a great variety of ways—as in pies, with sugar, spice, &c., or sliced and fried with oil or butter, or made into soups, &c. Pumpkins are much cultivated in North America. In England they are also cultivated, but not to a great extent, and never as food for cattle.—The Vegetable Marrow (*C. ovifera* or *C. succada*) appears to be a mere variety of the pumpkin. It is now more generally cultivated in Britain than any other kind of gourd, being one of the most hardy, and its fruit of excellent quality and useful for culinary purposes at almost every stage of its growth. When full grown the fruit is elliptic, very smooth, generally about 9 inches long and 4 inches in diameter; but there are many varieties distinguished by the form of the fruit and by the delicacy of the texture and flavour of the flesh.—One of the most valuable gourds for culinary purposes is the Great Gourd (*C. maxima*),

The Great Gourd (*Cucurbita maxima*): Branch with flower.

of which the Spanish Gourd is a green-fruited variety; and the Great Yellow Gourd, the largest of all, has yellow fruit, with firm flesh of a deep yellow colour. It is sometimes fully 200 lb. in weight and 8 feet in circumference. The form of the fruit is a somewhat flattened globe; when boiled it is a very pleasant and wholesome article of food. It is much cultivated in the south of

Europe. The French call it *Potiron*, and use it largely in soups.—The Squash (*C. melopepo*) differs from all these in generally forming a bush, instead of sending out long trailing shoots; also in the extremely flattened fruit, the outline of which is generally irregular, and its whole form often so like some kinds of cap that in Germany one variety is commonly known as the *Elector's Hat*, and the name *Turk's Cap* is

Fruit of *Cucurbita maxima*.

bestowed on another. The Squash is regarded as one of the best gourds, and is much cultivated in some parts of Europe and in North America. The Warted Gourd (*C. verrucosa*), which has a very hard-skinned fruit covered with large warts, and the Musk Gourd (*C. moschata*), distinguished by its musky smell, are less hardy than the kinds already named; as is also the Orange Gourd (*C. aurantia*), sometimes cultivated on account of its beautiful orange-like fruit, which, however, although sometimes edible and wholesome, is not unfrequently very unfit for use, on account of colocynth developed in it. This is apt to be the case in some degree with other gourds also, but the bitter taste at once reveals the danger. The same remark is applicable to the young shoots and leaves, which, when perfectly free from bitterness, are an excellent substitute for spinach. In Scotland even the most hardy gourds are generally reared on a hotbed and planted out. In England it has been suggested that railway-banks might be made productive of a great quantity of human food by planting them with gourds. Ripe gourds may be kept for a long time in a cool well-ventilated place, nor are they injured by cutting off portions for use as required. The name gourd is often extended to many other Cucurbitaceæ. See CUCURBITACEÆ, CUCUMBER, &c.; also BOTTLE GOURD.

Gourock, a watering-place of Renfrewshire, on the Firth of Clyde, 3 miles WNW. of Greenock by a railway opened in 1889, since which time it has become the starting-point of several lines of steamers. At Kempoch Point here, behind which rises Barrhill (478 feet), stands 'Granny Kempoch,' a prehistoric monolith associated with the witches of Renfrewshire (1662). In 1688 the first red herring ever cured in Great Britain was cured at Gourock. Pop. (1841) 2169; (1891) 4471. See D. Macrae's *Notes about Gourock* (1880).

Gout (Fr. *goutte*, from Lat. *gutta*, 'a drop'), a medieval term of uncertain date, derived from the humoral pathology (see RHEUMATISM), indicating a well-known form of disease, which occurs for the most part in persons of more or less luxurious habits, and past the middle period of life. In its most common and easily recognised form, it manifests itself by an acute inflammation in the neighbourhood of one of the joints, usually the ball of the great toe; and to such attacks only the name was once applied. But its use is now extended by most writers to include all injurious effects in any part of the body produced by the same condition of the system which leads to the inflammation of the joints. The name podagra (Gr. *pod-*, 'foot,' and *agra*, 'seizure') indicates the leading character of the disease as apprehended by all antiquity; and the very numerous references to the disorder so called, not only in the medical writings of Hippocrates, Galen, Aretæus, Cælius, Aurelianus, and the later Greek physicians, but in such purely literary works as those of Lucian, Seneca, Ovid, and Pliny, show not only the frequency, but the notoriety of the disease. The allusions, indeed, are of a kind which give ample proof that the essential characters of gout have not been changed in the lapse of centuries. It is caricatured by Lucian in his burlesque of *Tragopodagra* in language quite applicable to the disease as now observed; while the connection of it with the advance of luxury in Rome is recognised by Seneca (*Epist.* 95) in the remark that in his day even the women had become gouty, thus setting at naught the authority of physicians, which had asserted the little liability of women to gout. Pliny likewise (book xxvi. chap. 10) remarks upon the increase of gout, even within his own time, not to go back to that of his father and grandfather; he is of opinion, further, that the disease must have been imported, for if it had been native in Italy it would surely have had a Latin name. Ovid and Lucian represent gout as mostly incurable by medicine; from this view of it Pliny dissents. The list of quack remedies given by Lucian is one of the most curious relics of antiquity.

General Causes of Gout.—In more than half the cases gout can be traced to inheritance. There is in fact no disease in which hereditary transmission is more clearly established; in some families its recurrence is notorious. Professor Cantani of Naples even states that in his country 'the hereditary tendency has been handed down from the period of the Greek colonisation and the Roman empire.' Yet even in those strongly predisposed to it its actual occurrence may be avoided by strict regulation of the diet and habits. For, if it is certain that it may be inherited, it is no less certain that it may be acquired, though perhaps not, at all events not readily, by every one; and that the most important of the causes which lead to it are errors in diet. Of these popular opinion has seized upon excessive consumption of alcohol alone; and there is no doubt that alcohol, especially in the form of strong wine or beer, has a powerful effect. But complete abstinence from alcohol will not protect those predisposed to it from the development of gout, unless they are careful with regard to food as well; overeating, especially excessive indulgence in animal food and in rich and highly-seasoned dishes, is no less certain to be prejudicial. Too little exercise, especially when associated with too much food or drink, is also hurtful. Chronic lead-poisoning is frequently associated with the development of gout, though the reason of this is not yet understood. Gout is much more common in the male than in the female sex. It is said to be most common at the present day in England, especially in London, and in southern Italy.

Essential Nature of Gout.—It has long been known that the *tophi* or *chalkstones* deposited under the skin in most well-marked and severe cases of gout consist largely of urate of soda; and that Uric Acid (q.v.) and its salts are often excreted in large amount in the urine of gouty persons. But it was first shown by Dr (now Sir) A. Garrod that this substance is always present in considerable quantity in the blood in cases of gout; in chronic gout at all times, and in acute gout for

some time before the occurrence of an attack. It is now agreed by all that the presence of this substance in excess in the system is an important factor in the production of gout; but authorities differ as to how its presence is to be explained. There are two main theories on the subject which it must suffice to mention: (1) that the processes of disintegration going on in the body, particularly in the liver, lead to its formation in excessive amount; (2) that there is not excessive formation, but defective elimination of it by the kidneys. There is, however, a third theory with regard to the origin of gout, which attributes its occurrence to a perverted condition of the nervous system, and regards the presence in excessive amount of urate of soda in the blood as a subordinate though still important feature of the disease.

Symptoms of Acute 'regular' Gout. Sydenham's treatise on gout, written 200 years ago, is interesting not only as containing the well-considered views of a master in the medical art, but also as the faithful description of the disease by one of the victims of it. His account of the paroxysm of regular gout may be given here with some abbreviation. After some weeks of previous indigestion, attended with flatulent swelling and a feeling of weight, rising to a climax in spasms of the thighs, the patient goes to bed free from pain, and having had rather an unnaturally strong appetite the day before. In the middle of the night he is awakened by a pain in the great toe, or sometimes in the heel, the ankle, or the calf of the leg. The pain resembles that of a dislocated bone, and is accompanied by a sense as if water not perfectly cold were poured over the affected limb; to this succeeds chilliness, with shivering, and a trace of feverishness, these last symptoms diminishing as the pain increases. From hour to hour, until the next evening, the patient suffers every variety of torture in every separate joint of the affected limb; the pain being of a tearing, or crushing, or gnawing character, the tenderness such that even the weight of the bedclothes, or the shaking of the room from a person's walking about in it, is unbearable. The next night is one of tossing and turning, the uneasy limb being constantly moved about to find a better position; till towards morning the victim feels sudden relief, and falls over into a sleep, from which he wakes refreshed, to find the limb swollen; the venous distention usually present in the early stage having been succeeded by a more general form of swelling, often with itching between the toes, and a peeling-off of the cuticle. This individual attack may be repeated many times in the course of what is termed 'a fit of the gout,' which sometimes extends over a period of weeks, or even months, before the patient is completely relieved; or the attacks may occur in both limbs, or in several other parts of the body in succession, the real termination of the 'fit' being at last indicated by an apparently complete restoration of health, and even, in some cases, by a period of improved condition and capacity for exertion, as compared with the state of the patient before the attack.

Such are the principal features of the 'regular gout.' In this form it might almost be called a local disease; although the connection of the attacks with deranged digestion, or with a variety of other minor ailments too complex to be described here, and the obvious relief obtained through the 'fit' from the symptoms of constitutional suffering, point to a cause of the disease operating over a larger range of functions than those included in the ordinary local manifestations at this period. Regular gout, accordingly, forms only part of a nosological picture, in which the so-called irregular, atonic, metastatic, or retrocedent forms have to be included before it can be said to be at all complete. These, indeed, form almost all the darker shadows of the picture; for regular gout, though a very painful disorder, can hardly be said to be dangerous to life, or even to the limb affected, at least until after many attacks.

It is the tendency, however, of gout to fall into irregular forms; and herein lies its danger. One source of local aggravation is, indeed, soon apparent, and it leads rapidly to other evils. The joints which have been repeatedly the seat of the regular paroxysm become, more or less permanently, crippled and distorted. A white, friable, chalk-like material is gradually deposited around the cartilages and ligaments, and sometimes in the cellular tissue and under the skin (tophi or chalk-stones). Sometimes this material is discharged externally by ulceration, and then usually with relief. At other times it accumulates into irregular masses, or 'nodosities,' which entirely destroy, or at least greatly impair, the movement of the limb. The patient is laid up more or less permanently in his arm-chair; and exercise, the great natural specific remedy of the gouty, is denied by the very conditions of the diseased state itself.

Other Manifestations of Gout.—With regard to what should be included under the term *irregular* gout there is much difference of opinion. It is sometimes no doubt used as a refuge for ignorance, when no other cause can be discovered to explain symptoms of ill-health. It is certain, however, that regular gout often alternates with a morbid condition in some other part of the body, and that many diseases occurring in those whose family history or habits of life may be considered to predispose to gout, whether they themselves have suffered from regular gout or not, are benefited by hygienic and medicinal measures similar to those which do good in undoubted cases of gout; and most physicians agree in speaking of such as forms of gout. The most important of these we shall here enumerate, in connection with the organs affected. *Heart and blood-vessels*—palpitation, irregularity of heart action, angina pectoris, and atheroma with its consequence, phlebitis. *Lungs*—asthma, bronchitis. *Nervous system*—neuralgia, headache, epilepsy, mental disorder. *Skin*—eczema. *Digestive organs*—inflammation of throat, various forms of indigestion, cramp or inflammation of stomach, jaundice. *Urinary organs*—irritability of bladder; stone, especially the uric acid form (see CALCULUS); diabetes; above all, chronic Bright's disease. It is impossible within the limits of such an article as the present to give any description of the various manifestations of the gouty tendency; the above list of ailments (most of them treated separately) will give some idea of their complexity and importance.

Treatment of Gout.—The *cure* of gout, in the highest sense of the word, demands the careful consideration of all its predisposing causes in the individual, and the strict regulation of the whole life and habits accordingly, from the earliest possible period. It is the difficulty of accomplishing this which makes gout a disease proverbially intractable; for the regular attacks of the disease seldom occur till pretty late in life, long after the habits have been fully formed which are most adverse to the cure. Rigid temperance in eating and drinking, with daily exercise proportionate to the strength and condition of the individual, in reality constitutes the only radical cure of the gout, the lesson of ages of experience as read to the gouty by the light of science. But the lesson is not learned, or only learned when too late. It should never be forgotten that a man of gouty family, or individually much exposed to the causes of the disease, can only hope to escape it in his old age by habits of life formed at an early period, and by a

careful avoidance of most of the common dissipations of youth. That the disease may be warded off in this way there is ample evidence; and it is not less certain that there is no other way of living secure from gout. The treatment of the fit, in so far as it does not resolve itself into the celebrated prescription of 'patience and flannel,' must be a subject of medical prescription. Blisters, leeches, and especially cold applications, though they may give temporary relief, are studiously to be avoided; the last sometimes even lead to a fatal result. The well-known virtues of Colchicum (q.v.) are perhaps somewhat overrated by the public; and its dangers are not less striking than its virtues. It is certain, however, that in cautious medical hands colchicum is a remedy of great value in the gouty paroxysm; and of equal value perhaps are certain natural mineral waters, as those of Vichy and Carlsbad. Alkalies and their salts, especially potash and lithia waters, as prepared artificially, with minute doses of iodine and bromine, have likewise been much recommended for the cure of gouty deposits. For the distinctions of gout and rheumatism, and the presumed relation between them in some cases, see RHEUMATISM. See Sir Dyce Duckworth's *Treatise on Gout* (1889).

Goutweed. See BISHOPWEED.

Govan, a police-burgh (since 1864) of Lanark and Renfrew shires, on the south bank of the Clyde, outside the municipal boundaries of Glasgow, and about 3 miles west of its centre, but connected with the city by continuous rows of buildings. Its leading industry is shipbuilding. Govan Park, 40 acres in extent, was gifted in 1885 by Mrs Elder, at a cost of £50,000. Pop. (1836) 2122; (1871) 19,200; (1881) 50,492; (1891) 63,364.

Government. The term 'government' signifies the administration of the public affairs of a community; in a secondary sense it denotes the persons to whom that administration is committed, or a select number of such persons in whom the principal powers of management are vested. The domain of government extends in theory over the whole legislative and administrative business of the country at home and abroad; but some departments of our domestic affairs, such as the administration of justice and the business of the permanent civil service, are not treated in practice as matters of government. According to the various uses of the term, we speak of our constitutional government or our system of government by party, or the policy of a particular government, and we draw a distinction, when necessary, between the principal and the subordinate members of the government of the day. There is a distinction in kind between the administration of public affairs and the management of any private concern; but we speak metaphorically of the domestic government of a household; or, with a nearer approach to correctness, of the self-government of municipalities and other civil districts in regard to their local affairs. There may also be small and imperfectly developed communities, whether carried on under a patriarchal rule or under the form of a village-community, or in some other rudimentary form of society, to which it would be difficult to apply the terms of the art or practice of government with anything like exactness. In the case of an ordinary independent state the sphere of government includes the administration of public affairs at home and the intercourse of the community with foreign nations. These functions may be separated and modified, as when a state forms part of a federal union or confederation or combination of states, in which the component communities have divested themselves of some portions of their sovereign power in favour of a central or combined authority, to which certain kinds of public affairs have been delegated. The same remarks apply to dependent and semi-independent states, including such as have been brought under an empire, or have been mediatised, or neutralised, or in any other way have come under the protection or management of a superior power or combination of powers. In colonies the local authorities may be entitled to exercise the rights of government almost as freely as in the case of a protected state, subject only to the reserved rights of the mother-country and the supreme dominion of the home-government, if the necessity for its exercise should occur. There is indeed hardly any limit to the modes in which the relations between superior and subordinate communities may be constituted in matters of government, subject to the observation that the rights conferred on the inferior power may be so great that they practically amount to independence, or may be so closely bound that they give hardly more than the benefits of municipal self-government.

The origin of government may be found in the social instincts of mankind. As soon as a community attains to great numbers, or a large extent of territory, some form of regular authority will be required and will necessarily be established. Plato is accused of having seen no difference in kind between a large household and a small state. Aristotle, or the Aristotelian author of the *Politics*, conceived the state as being 'prior to the individual,' in the sense that it is the true object of the social instinct implanted in all men, and only requiring the legislator's wisdom to bring it to perfection. Every community is established with a view to some good end, and the state (which embraces all other communities) must have been established with the object of attaining the highest good. This theory is nearly identical with the modern opinions, in which a distinction has been made without much real difference, that the state was founded with the object of obtaining the greatest happiness of the greatest number, and that governments are intended to fulfil the higher aspirations of humanity. Many other theories of government have been advanced according to the varying circumstances of different times. It was found convenient in one age to secure a respect for authority by an appeal to the divine right of kings; at another time thinkers have been content to find the principles of government in following the momentary wish of the majority. Hobbes solved the difficulty by a new and arbitrary dogma. Mankind, according to his view, seeking refuge from the dangers of a state of nature, were led, not by any social instinct, but by motives of fear and prudence, to enter into a solemn compact by which they finally renounced the freedom which belonged to the individual man. The compact having once been made, the state becomes the 'Leviathan,' or all-powerful being, to whom absolute and unchanging obedience is due. Locke and many later writers took up the idea of a social contract as a convenient image for describing the combined action of mankind, but guarded their position by declaring that the compact might at any time be altered or reversed.

We may leave these barren speculations as to the origin of government with the remark that, according to the more modern opinion, such questions can only be solved, if at all, by the methods of comparative history. It is of more importance to inquire as to what are the essential characteristics of government in the political sense of the term. In the consideration of this part of the subject the mere forms of government may be disregarded. The correct answer to the problem seems to be that government, in

relation to the subject-matter with which it is concerned, is in the long-run, and continually tends to be, the expression of the will of the dominant power in the state. The expression may be difficult, owing to the complexity of the constitution or the number of constituent parts among which the power is distributed, or owing, as often happens, to the existence of artificial restrictions designed to afford opportunities for delay. Again, the will of the real rulers may be in a state of acquiescence, and the arriving at any decision in favour of change may be impeded in many ways, as by the influence of custom and tradition, the reluctance felt about disturbing an existing delegation of power, or the feeling that responsible and removable governors can safely be trusted. After making all deductions it seems clear that government is in fact an expression of the wishes of those who have the ultimate dominion, and that in free communities its course and even its form are determined by the general will of the people. The forms of government are, however, in some degree determined by accidental circumstances, such as the survival of institutions which have become obsolete, or which have been adapted to existing needs though their original object has come to an end. The possible variations in the form of government are almost countless, but it is still convenient to adopt to some extent the ancient methods of classification, according as the rule of the state is given to the one, the few, or the many. Another method of division is based on the distinction between those states in which the governors and governed have apparently been opposed to each other, and those in which the contest between prerogative and popular liberty has ended in national self-government.

Plato and Aristotle distinguished governments as true or pure when power is given and used for the good of the subject, and as false or perverted when it is maintained for the private interest of the ruler. Among such true forms they counted monarchy or royalty, in which one ruled for the good of all, and aristocracy or the rule of a class, equally acting in the common interest; besides these rare and ideal forms they found another pure form in the mixed or constitutional government, which was the favourite 'polity' of the Greek states when placed under favourable circumstances. It must be remembered, however, that their arguments are made difficult of application to modern times by the facts that the states were very small, and that the great bulk of the population was enslaved; the last circumstance gave a disproportionate importance to the military class, on which the existence of society depended, so that the ancient 'polities' were in practice dominated by an armed middle class, taken collectively as representing the whole people. Hence it was expressly laid down in the Aristotelian *Politics* (lib. iii. chap. 7), that 'in a constitutional government the fighting-men have the supreme power, and the armed men are the citizens.' In the same place will be found an account of the perversions of true government. 'Tyranny,' or despotism, is a monarchy having in view the interest of the master of the state. Oligarchy, of which there are many varieties, exists when a small class, generally consisting of the rich, has the whole government in its power. In Aristotle's view the rule of a wealthy class was of the essence of an oligarchy. Democracy, or the rule of the many, was on the same principle identified with government in the interests of the needy. The author of the *Politics* does not seem to have believed that a wealthy community could be a democracy, or to have conceived the idea of representative government or of a democracy in the modern sense of the term. The democracy described by him was obviously of an unstable and temporary character, ready to suffer a further perversion towards ochlocracy or a mere mob-government, ending in anarchy and the eventual interposition of a despotic or military form of government.

Aristotle distinguished five kinds of monarchy among the true or legitimate systems. The first was the Spartan form, or that which existed in Crete, the power of the kings in each case being strictly limited by the constitution. Next came the despotic form of monarchy, such as was found in the Asian empires, differing only from tyranny because the barbarians, as slaves by nature, were perfectly willing to obey. The third was the Dictatorship, which in Greece was not hereditary, but which has always tended in modern times to become so. Another kind might be called the Heroic form, the kings in ancient times having been 'priests, and judges, and warriors, and having a supreme authority in all things.' Last in the list was the absolute kingship, 'exercising an universal power, like that of the state over the public property, or that of the master over a household' (Arist. *Pol.* iii. chap. 15; Jowett's *Introd.* lxv.). The last-described monarchy is certainly a separate form of government, but it was obviously liable to pass at any moment into a tyranny, unless a succession of disinterested 'benevolent despots' could be found. It should be observed that Aristotle did not think that any monarchy ought to be hereditary, and that he considered absolute monarchy to be contrary to the law of nature. His summary of the causes which had induced the transition from the old kingship to the modern republic is full of interest and information. The reason, he says, why ancient governments were monarchies is that in early times there were only a few good men who could confer benefits, and so they were made into kings. The reason, he adds, why democracies are now necessary is that all men are 'pretty much on an equality;' he is referring, of course, to the freemen who had the franchise and a capacity for office. 'When good men increased in number, royalties passed into aristocracies. These degenerated into oligarchies. Oligarchy passed into "tyranny," and tyrannies became democracies, for the rich became fewer and fewer, and the poor more and more numerous; and democracy seems to be the only form of government any longer possible, now that cities are increased in size.' He shows, however, his personal preference for the mixed constitution or 'polity,' as probably the best form of government after the ideal 'rule of the best,' or 'aristocracy' in the highest sense of the term. The stages through which oligarchy usually passed are summed up as follows: at first there is a high qualification for office, and then as vacancies in office occur, a scheme of co-optation is devised: afterwards hereditary succession is introduced, and finally a few powerful families set up an absolute and arbitrary rule. Democracy in the same way has several stages from that in which all men are equal in circumstances and power, if such an 'Utopian parity' were possible, to the stages when a small qualification is imposed, when every one takes a share in the government, and lastly, when law ceases and the government is carried on by the decrees of the transient majority.

Plato constructed an ideal state, an aristocracy in which philosophers were kings, and thought that of inferior governments there were only four worthy of notice, though, doubtless, there were many intermediate forms both among Greeks and barbarians. He calls the first Timocracy, being a constitution of the fashionable Spartan type, in which the powers of the kings and classes of citizens were limited by strict discipline, and the government was conducted on 'principles of honour,'

which in practice came to something like military government. It should be observed that the word 'timocracy' is also used to denote the system of distributing honours and offices according to wealth, a state of things to which the title of a plutocracy would perhaps be more appropriate. Next in Plato's list came Oligarchy, with its attendant evils of avarice and corruption; then Democracy, described as 'a pleasing lawless and various kind of government;' and lastly, Despotism, the 'disease and death of government.' Polybius (book vi. extr. 3, chap. 1) mentions the states of Lacedæmon, Mantinea, Crete, and Carthage as those which were praised by all writers of antiquity. He differs from Plato as to the fact of resemblance between the governments of Crete and Sparta, not perceiving that they were alike in their balance of power, though their laws and institutions were different. The laws of Lycurgus appeared to him to be rather the 'work of some divinity' than the effort of a human mind. The government of Carthage was praised as being limited in much the same way, the king, senate, and people all having a share of power; but his highest commendation was reserved for the Roman Republic. Of this he has left an interesting account, of which Cicero afterwards made considerable use in his treatise *De Republicâ*.

Passing to modern times, we find that the existing kinds of government are still in many cases much influenced by traditions of the empire, and to some extent by the usages of feudalism. The autocratic form of government still survives, though the ruler's apparently absolute power is generally limited by a 'bureaucracy.' In the greater part of Europe we find constitutional monarchies, in which the powers of the crown and the various classes in the community are supposed to be balanced against each other. The tendency of most of these limited monarchies is apparently towards democracy. The democratic republic has been most successful in the United States of America and in the old-established Swiss Confederation. We have also seen the establishment of empires of a medieval type, as well as governments founded on a principle called Cæsarism, in which a democracy is supposed to have delegated its powers to a dictator. Various circumstances have led to the formation of dual and complex monarchies, and to the placing of various communities in dependent and subordinate positions. The most important feature in modern governments is the extension of the representative system, which can be best studied in the history of Great Britain, justly praised as the 'Mother of Parliaments.' Mr Mill's work on *Representative Government* should be consulted on the question whether our modern societies ought to make provision for protecting the minority. The problems of government are continually changing, and new remedies will be required as fresh difficulties arise, but the main object of all governments, under whatever forms they exist, must be the fulfilment of the laws and the preservation of order and liberty.

What is the best form of government is a question which every one will answer according to his own disposition, if a specific answer can be given without reference to the varying circumstances of states and communities. Some aid in the matter may be obtained by the study not only of treatises dealing directly with the art of government, but also of political satires and the numerous writings upon the ideal state and the first principles of society. Among these may be mentioned the *Utopia* of Sir Thomas More, the *De Monarchiâ* of Dante, the sketch of a new government in Burton's *Anatomy of Melancholy*, Harrington's *Oceana*, and Lord Bacon's *New Atlantis*, besides Dr Jowett's Introductions to the *Republic* and *Politics*, and the other treatises upon the subject which have already been mentioned.

Among the multitude of modern writings which deal with the abstract principles of government particular notice is due to Sir G. C. Lewis's treatises on the *Best Forms of Government* and the *Methods of Observation and Reasoning in Politics*. Mr Herbert Spencer's works on *Social Statics* and the *Principles of Sociology*; Humboldt on the *Sphere and Duties of Government*, and Guizot's *Histoire des Origines du Gouvernement Représentatif en Europe*. Among the treatises which deal with the growth of governments by the methods of comparative history Sir H. S. Maine's work on *Early Institutions* is one of the most important. A general view of the rise of the governments of Europe is to be found in Mr Hallam's *View of the State of Europe during the Middle Ages*, with which should be compared Guizot's *Histoire Générale de la Civilisation en Europe*. With respect to the growth of the British constitution the reader should refer to the general essays and histories of Hume, Macaulay, and Freeman, and for more special information to the constitutional histories of England by Mr Hallam and Dr Stubbs, Earl Russell's *English Government and Constitution*, Earl Grey's *Parliamentary Government*, and Bagehot's essay on the English Constitution. On the important subject of political institutions in America the fullest information may be found in Storer's *Commentary on the Constitution of the United States*, and in the valuable work of Professor Bryce on the *American Commonwealth*. See the articles ARISTOCRACY, AUTOCRACY, CABINET, CENTRALISATION, CIVIL SERVICE, COMMUNISM, CONGRESS, DEMOCRACY, LOCAL GOVERNMENT, OLIGARCHY, PARLIAMENT, PRIVY COUNCIL, SOCIALISM, &c.

Governor, the supreme executive magistrate of a state or colony. The varying functions of governors, governors-general, and lieutenant-governors are explained in the articles UNITED STATES, INDIA, &c. For the governor of a steam-engine, see STEAM-ENGINE.

Gow, NEIL, a famous Scotch violin player, was born at Inver, near Dunkeld, 22d March 1727, and before he reached manhood had become the best performer of reels and strathspeys in Perthshire. Through the notice of the Duke of Athole, with whom he was a life-long favourite, he was introduced to the patronage of the principal nobility and gentry throughout Scotland; and such was the kindly esteem in which he was held that Sir Henry Raeburn was several times employed to paint his portrait for his patrons. He died 1st March 1807. Gow composed nearly a hundred tunes, mostly of a lively character; but it is chiefly to the tradition of his singular skill with the bow that his name owes its survival almost as a household word in Scotland.—His youngest son, NATHANIEL, born 28th May 1766, was trained as a violin-player in Edinburgh, where in 1782 he became one of the king's trumpeters for Scotland, and subsequently was leader of a fashionable band, and a successful teacher. His first venture as a musicseller (1796–1813) was not successful, and a second attempt ended in bankruptcy in 1827; but his admirers came to his aid, and his few remaining years, though darkened by sickness, were not distressed by actual want. He died 17th January 1831. He published numerous and very full collections of Scotch airs and songs; and his own compositions number over two hundred—among them 'Caller Herring.'

Gower, part of Glamorganshire (q.v.).

Gower, JOHN, English poet, was born probably about 1330, and seems to have belonged to a family that owned land both in Suffolk and in Kent. But little is known of his life save that he was rich and well educated, did not marry till late in life (probably in 1397), became blind about 1400, and died in the later half of 1408. His tomb is still to be seen in St Saviour's, Southwark. He was a personal friend of Chaucer, who, in dedicating to

him his *Troilus and Cressida*, addresses him as the 'moral Gower'—an epithet that has indissolubly linked itself with his name. Near the conclusion of the *Confessio Amantis* Gower makes Venus in some copies pay a warm compliment to Chaucer as her 'disciple and poet,' which is followed immediately by lines expressing warm loyalty towards Richard II. Both these passages are omitted in the copy dedicated to Henry of Lancaster, then Earl of Derby (afterwards Henry IV.), which appeared at a time when Chaucer was in trouble with the government, and this fact, taken in conjunction with Chaucer's expressed dislike (Introduction to the Man of Lawes prologue) to a certain kind of sensational stories—of 'unkynde ('unnatural') abhominaciouns,' which he exemplifies by the stories of Canace and Apollinus of Tyre—two of the best told tales interspersed in the *Confessio Amantis*—led Tyrwhitt to the conjecture that the friendship between the two poets was interrupted in their old age. But in this there is really no ground for any inference further than that Gower was merely a timid and time-serving man; while the conjecture is completely demolished by the discovery that Chaucer's poem was written first (before 1385), and by the fact that Chaucer took the substance of the Man of Lawes Tale direct from Nicholas Trivet's French prose chronicle of the Life of Constance (written about 1334), and not indirectly through Gower's version of the same, as was supposed by Tyrwhitt, Wright, and most scholars down to the appearance of Mr Brock's English translation of Trivet in *Originals and Analogues of some of Chaucer's Canterbury Tales*, published for the Chaucer Society (1872–75).

Gower wrote three large works in three languages, the *Speculum Meditantis*, in French verse, rediscovered at Cambridge in 1896; the *Vox Clamantis*, a tedious Latin elegiac poem, written 1382–84, describing Wat Tyler's rebellion in 1381, full of dreary allegorising and moralisation (edited by Rev. H. O. Coxe, Roxburghe Club, 1850); and the long poem entitled *Confessio Amantis*, written 'in our English . . . for England's sake,' of which the date is uncertain, but it must have been in existence in 1392–93. In a passage in the earlier edition of the last work, dedicated to Richard II., he tells us how he met the king's barge one day when rowing down the Thames at London, and how the king invited him on board, and commanded him to write a book upon some new matter. There are extant also fifty French ballads, written by Gower in his youth (Roxburghe Club, 1818).

Gower's *Confessio Amantis* consists of a prologue and eight books, written in verses of eight syllables, rhyming in pairs. The long prologue gives a sombre account of the state of the world at that time, and the poem opens by introducing the author himself in the character of an unhappy lover. Venus then appears to him, and appoints her priest called Genius to hear the lover's confession of all the sins he has committed against love. Under each several head the confessor consoles him and gives him warning by relating apposite stories of the fatal effects of each passion in the experiences of former lovers in like case. It ends with the lover's petition in a strophic poem addressed to Venus, her judgment, and finally the lover's cure and absolution. The stories inserted are taken from Ovid's *Metamorphoses*, the *Gesta Romanorum*, the medieval histories of Troy and Alexander the Great, from the *Pantheon* and *Speculum Regum* of Godfrey of Viterbo, the romance of Sir Lancelot, and the Chronicles of Cassiodorus and Isidorus. The mixture of Ovidian and Christian morality is often incongruous enough, and the whole poem is dull and prolix to the last degree. Without originality, narrative power, pathos, or humour, Gower yet commands respect for the laborious equality of his verse, and his work remains a splendid monument of English. Mr Lowell is too severe upon his uniformity of commonplace, his omnipresent tediousness, his imperturbable narrative, the tremendous hydraulic power of his allegory to squeeze out all feeling and freshness, the frozen levels of his verse, and the inevitable recurrence of his rhyme regularly pertinacious as the tick of an eight-day clock; although indeed it cannot altogether be denied that 'he has positively raised tediousness to the precision of science, and has made dullness an heirloom for the students of our literary history.' The best editions are by Dr Reinhold Pauli (3 vols. Lond. 1857) and G. C. Macaulay (4 vols. 1899-1901, vol. i. giving Gower's works in French).

Gown, a loose upper garment worn by members of universities, civil magistrates, and the like. The use of the gown by ecclesiastics has been erroneously derived from the custom of the friars, but is more probably to be traced to the practice of inviting doctors of divinity to preach, and to the power of the university to license graduate preachers. Originally the gown was merely the out-of-door dress; and after the Reformation the clergy (mostly Puritan) who did not hold degrees, regarding enviously the comely wide-sleeved gown which was the mark of the graduate, adopted a gown of their own or of Genevan devising. In 1444 all doctors and graduates of the Benedictine order were authorised to use their scholastic habit when preaching before a large congregation; and in 1571 the gown formed part of the preacher's 'common apparel abrode.' Addison, in the *Spectator* (1714), speaks of the clergy 'equipped with a gown and a cassock;' and both garments were retained until within the 19th century. In Edinburgh, at the coronation of Charles I., the Archbishop of Glasgow and others not engaged in the service 'changed not their habit, but wore their black gowns without rochets or sleeves;' but in the same year a warrant was sent down from London, directing the use of the 'whites' by bishops and archbishops, and ordering all inferior clergymen to preach in their black gowns, but to use their surplices while reading the prayers and in other services. In the 18th century, however, even during the service, the surplice was almost unknown in the Scottish Episcopal Church. The controversy in the Anglican Church as to exchanging the surplice for the gown in preaching, which arose about 1840 and exercised the church for a generation, has never received a definitive settlement.

The academic gown is a survival of the *tabardus*, a garment with many folds, which came in when the doctors began to wear long, priestly robes as a distinctive mark of their standing as clerics. At Padua, for instance, certainly as early as the 16th century, the gown and square cap were the insignia of a doctor; and, at a later period, the undergraduate of Trinity College, Cambridge, wore a gown of violet colour to distinguish him from the doctors, who wore a scarlet gown. The purple gown common to all rectors of universities has been described as the livery of the popes: in the words of the Emperor Joseph II., it is a reminiscence of 'the dark times when the papal see arrogated to itself the exclusive right of establishing universities.' On the Continent the several faculties possess distinctive colours, although in some universities, as at Leipzig and Tübingen, only two colours have been used. In Britain a similar custom obtains in the full dress of doctors; the faculty, like the university, of a graduate is indicated by his hood. The gowns of under-graduates are now black, except at Glasgow, Aberdeen, and

St Andrews; but in some of the English universities surplices are worn in college chapel on Sundays and saints' days. University preachers in England wear academic gowns. In the United States there is no distinctive academic dress. See *Notes and Queries*, 5th series, vol. xi.; and a paper in Prof. Delitzsch's *Iris* (Eng. trans. 1889).

Gowrie, CURSE OF. See PERTHSHIRE.

Gowrie Conspiracy is the name given to one of the most singular episodes in the history of Scotland, although the very existence of a plot is still a matter of controversy. As set forth by James VI., the details of the conspiracy are as follows. Early in the morning, on Tuesday, 5th August 1600, as his majesty was about to begin a stag-hunt in Falkland Park, Fife, Alexander Ruthven came to him with the information that, as he was walking alone near Perth, on the previous evening, he had met and seized an individual of suspicious appearance, with a pot full of foreign gold hidden under his cloak. After having confined him in 'a privy derned house,' he had hastened to Falkland to lay the matter before the king, and to request him to ride over to Perth for the purpose of taking possession of the treasure, and of examining the mysterious stranger. Though at first disinclined to believe the 'uncouth' story, James was ultimately induced, by the thought that the foreign money might betoken an agent of the pope and the Jesuits, to promise that he would accompany Ruthven to Perth. This he did at the close of the hunt, not waiting to change his horse, and riding at such speed that his attendants, amongst whom were the Duke of Lennox and the Earl of Mar, did not overtake him till within a short distance of the city. At Perth he was received by Ruthven's brother, the Earl of Gowrie, in such a manner as to make it appear that the visit was wholly unexpected, and kept waiting a long time before any refreshment was offered him. After his own dinner, and whilst the gentlemen of his retinue were still at table, James was taken by Ruthven through several rooms to a small study, which was situated on the first story, and of which one of the windows overlooked the courtyard of Gowrie House and the other a public street. On crossing the threshold the king beheld 'not a bound man, but a free man, with a dagger at his girdle.' At this moment Ruthven, having locked the door, snatched the armed man's dagger and held the point to the king's breast, telling him that he was now a prisoner, swearing many bloody oaths that if he cried or made any attempt to open a window the dagger would go to his heart, and, further, reproaching him with the murder of the first Earl of Gowrie, who had been executed for treason in 1584. At this James began to expostulate with Ruthven, who so far relented as to leave the king in the armed man's keeping, while he himself went out to consult his brother, the earl. During his absence James questioned the armed man, who protested that he had been thrust into the room without knowing for what purpose, and who willingly obeyed the order to open one of the windows, the king himself, scrupulously faithful to a promise extorted from him by Ruthven, being unwilling to do so. In a few moments Alexander returned, and, declaring that there was no help but that the king must die, produced a garter with which he attempted to bind his hands. A fierce struggle ensued, during which the armed man stood behind the king's back, 'doing nothing but trembling all the time,' and of which the result was that James was able to reach the open window and to call for help. Whilst this was going on in the study, a servant of the household had entered the hall where Gowrie still was with Lennox, Mar, and the other courtiers, and informed him that the king had ridden off to Falkland. At this the whole company hastily rose to follow, and had reached the street when the king's cries were heard. Lennox, Mar, and the other attendants at once turned back and made for the upper story by way of the main staircase, but were prevented by a barred door from reaching the king. John Ramsay, a royal retainer, had also heard his master's voice, and, finding a door open at the foot of the turret, at once entered and ran up the winding stairs. They led directly to the study, of which Ruthven had forgotten to close the entrance, and in which the hand-to-hand struggle was still going on. Drawing his hunting-knife Ramsay twice stabbed the king's antagonist, who, loosing his hold, was thrust down the stairs by James and despatched by Sir Thomas Erskine and Dr Herries, who were at that moment coming up; his last words were 'Alas, I had na wyte (blame) of it.' Scarcely had this taken place when the Earl of Gowrie appeared on the scene, bearing a drawn sword in each hand, and followed by seven of his servants. A short encounter ended with the death of the earl, who expired without uttering a word. The inhabitants of Perth, by whom Gowrie, who was their provost, was much beloved, hearing of his fate, surrounded the house and threatened revenge. But after the king had addressed them from a window, and admitted the magistrates, to whom he related the circumstances, they quietly dispersed, and James was able to return to Falkland. On the authority of the king's declaration Gowrie and Ruthven, whose dead bodies were produced at the bar, were declared traitors, and three of their servants were hanged. On the other hand, marks of royal favour were bestowed on all who had come to the king's assistance in the study. Ramsay was knighted, and subsequently created Viscount of Haddington and Earl of Holderness; Sir Thomas Erskine was raised to the peerage as Lord Dirleton, and Dr Herries received the honour of knighthood as Sir Hugh Herries of Cowsland. Henderson, the 'armed man,' after having obtained a free pardon, was rewarded with a gift of lands and a large pension.

To the events of 1600 there was a sequel a few years later. In 1608 George Sprott, a notary in Eyemouth, was apprehended, condemned, and executed for being privy to a conspiracy between Gowrie and Robert Logan of Restalrig. He confessed to having seen several letters written by Logan to the earl, and to having retained one of them, but no document of the kind alluded to was actually put in at the trial. Next year, however, there were produced five letters, said to have been discovered amongst Sprott's papers, and alleged to contain proof of a plot to kidnap the king. On the strength of them Logan, who had died in the meantime, but whose mouldering bones were dug up and brought to trial, was declared to have been guilty of high-treason. From the very first the story of the conspiracy was received with incredulity by many in Scotland, and amongst these by the clergy of Edinburgh, with Robert Bruce at their head, and by the queen herself; whilst the Duke of Lennox, though he had appeared as one of the chief witnesses at the trial, asserted that 'if it were given to him to his oath, he could not say whether the practice proceeded from Gowrie or the king.' In England Elizabeth, on being informed by a special messenger of what had taken place, gave him to understand that she 'did not believe Gowrie and his brother to be so guilty as they were represented.' In France James's statement was openly ridiculed. This attitude of scepticism is still

maintained by some writers, who point out that, with the exception of Burton's general remark that 'seizing upon or kidnapping a king had in that day become almost a constitutional method of effecting a change of ministry in Scotland,' nothing has ever been urged to prove that either Gowrie or Ruthven could benefit by the king's murder or captivity, whilst by the death of the earl and his brother James was freed from a debt of over £80,000, and rid of a political opponent in the person of the one, and possibly of a rival in the queen's affection in that of the other; that, whilst there is no trustworthy evidence to prove the interview in Falkland Park to have been of Ruthven's seeking, the king very shortly before had sent letters to both the brothers; that, whilst the reason alleged by the king to account for his visit to Gowrie House is palpably absurd, that given by Ruthven, who ascribed it to the matter of the debt, is reasonable; that the point which tells most against Gowrie—viz. his conduct on receiving the false information of James's departure for Falkland—is not inconsistent with innocence; that the position of the study to which the king was taken makes it incredible that it could have been selected for a criminal purpose; that in his various statements Henderson, who was produced as being, but was not generally believed to have been, the 'armed man,' contradicted not only the king and Ramsay, but himself as well; that Ruthven's dying exclamation, 'Alas, I had na wyte (blame) of it,' may reasonably be looked upon as referring to the origin of his struggle with the king; that Sprott, whose confession was the only evidence connecting Gowrie and Restalrig, was looked on as a madman by the king's warmest sympathisers; that the famous letters were not produced at his trial; that in the following year they did not at first convince the jury, who brought in a verdict of guilty against Logan only after they had been remonstrated with by the Earl of Dunbar; and, finally, that those letters bristle with discrepancies, contain no proof of a plot for the abduction of the king, whom they do not even mention, and cannot, from their dates, be made to refer to any event intended to take place till long after the 5th of August. There is yet another view adopted by those who, whilst admitting the innocence of Gowrie and Ruthven, find it difficult to believe that the king devised a plot in which he was himself to play a dangerous part. It is in substance the same as that set forth at the time by Sir William Bowes, the English agent in Edinburgh, in a letter to Sir John Stanhope. It is to the effect that there was no conspiracy on either side, but that the struggle in the study arose out of some sharp words that passed between the king and Ruthven concerning the execution of the latter's father, and that all the subsequent events were in part contrived, in part utilised, for the purpose of giving James's conduct what Bowes calls 'an honourable cloak.' See Louis A. Barbé's *Tragedy of Gowrie House* (Paisley, 1887).

Goyana, a town of Brazil, 40 miles N. by W. of Pernambuco, with a large Carmelite monastery, and flourishing sugar-plantations. Pop. 10,000.

Goya y Lucientes, Francisco, the most distinguished painter of the new Spanish school, was born at Fuente de Todos, in Aragon, 30th March 1746, and received his first education in art in the academy at San Luis, Saragossa. On his return from a visit to Rome, the talent and speed with which he executed some paintings for the royal tapestry manufactory gained the approbation of the celebrated Mengs, who superintended that work. His scenes from the common life of the Spanish people excited special admiration. In 1780 he was elected member of the academy of San Fernando. From this time, although he remains in all his work a thorough Spaniard, the influence of Velasquez and Rembrandt is observable in his paintings. Among the most celebrated of these is his portrait of Charles IV., for which he was made court-painter. In 1824 he went to Paris for his health, and continued to reside in France till his death at Bordeaux, 16th April 1828. See Lives by Yriarte (1867), Lefort (1877), De la Viñaza (1887), and Rothenstein (Lond. 1900).

Goyaz, the central province of Brazil, falls within the dry plateau region, rising in the south to an important range of mountains (see Brazil), and has an area of 287,430 sq. m. The river Tocantins traverses most of the province from south to north, and receives the Araguay, which forms the western boundary; the southern frontier is marked by the Paranahyba. The climate in the south is healthy, but in the north malignant fevers are common, and the cattle are subject to goitre. The province had once some fame as a source of gold and diamonds; but these products are exhausted, and its deposits of iron and rock-salt are not worked. Stock-raising is the chief industry, the cattlemen being mostly half-civilised *vaqueiros*. The population was estimated in 1895 at 230,000, mostly half-castes. There are also several thousand wild Indians.—The capital, Goyaz, on the Vermelho, a tributary of the Araguay, preserves in its cathedral and large government buildings traces of better days. Pop. 8000.

Gozo (called by the Romans *Gaulus*), an island in the Mediterranean, lying 4 miles NW. of Malta and belonging to Britain, has, with the adjacent smaller island of Comino, an area of 20 sq. m. and a pop. (1891) of 16,500. The surface is hilly, but the soil is fertile. The chief town is Babato, situated near the centre of the island. The history of Gozo is identical with that of Malta (q.v.).

Gozzi, Count Carlo, Italian dramatist, was born at Venice in March 1722. The publication of several slight but witty and satirical pieces made him known in his native city, and the part he took in combating the theatrical innovations of Chiari and Goldoni made him famous. For the purpose of counteracting the attempts of these two writers to free the Italian stage from the puerilities of the Commedia dell' Arte by the introduction of translations of newer French dramatic works, Gozzi wrote a satirical poem, *Tartana degl' Influssi per l'Anno Bisestile* (1757), and a comedy, *Fiaba dell' Amore delle tre Melarancie* (1761). In this last work he struck a vein which for a time proved to be extremely popular, and he wrote several similar 'dramatic fairy-tales,' as he called them, the best being *L'Augellino Bel Verde*. But the best known, from Schiller's translation of it, is *Turandot*, which Gozzi himself borrowed from a Persian source (Nizami). His latest dramas were modelled upon those of Calderon, but they enjoyed only a moderate success. Gozzi died 4th April 1806. In 1772-74 he edited a complete collection of his own works in 10 vols.; but a fuller edition came out at Venice in 14 vols. in 1802. See his Memoirs (1797; Eng. trans. by J. A. Symonds, 2 vols. 1889).—His brother, Count Gasparo Gozzi, was born at Venice, 20th December 1713. His first attempts in literature, the translation of dramas from the French for production in the theatre of Sant' Angelo at Venice, were not successful. But his next ventures, the editing of two journals, *Gazzetta Veneta* (from 1760) and *Osservatore Veneto* (from 1761), to which he contributed very copiously, established his fame as one of the most elegant writers of literary Italian. The second of these works was an attempt to

imitate the English *Spectator*. For some time Gozzi was press censor in Venice. He died at Padua, 26th December 1786. Besides the works named he also wrote *Il Mondo Morale* (1760), a collection of essays; *Lettere Famigliari* (1755); and *Giudizio degli Antichi Poeti sopra la Moderna Censura di Dante* (1758), a defence of the king of Italian poets against the strictures of Bettinelli. Collected editions of his works were published at Venice (12 vols. 1794–98, and 22 vols. 1812).

Gozzoli, Benozzo (properly Benozzo di Lese), an Italian fresco painter, a pupil of Fra Angelico, was born at Florence about 1420. At Montefalco (1450–52) he painted the 'Virgin giving her Girdle to St Thomas' in S. Fortunato, and a series of frescoes illustrating the life of St Francis, an Annunciation, and a Crucifixion, in the monastery of S. Francesco. At Florence (1456–64) he adorned the Palazzo Riccardi with scriptural subjects, and painted various similar frescoes at San Gemignano (1464–67). His name is likewise intimately associated with a series of twenty-four fine frescoes in the Campo Santo or cemetery at Pisa (1468–84). He died at Pisa in 1498. His works show great individuality of treatment, true landscape feeling, and something of the naturalistic tendencies of Fra Filippo. See an article by Stillman in the *Century* for November 1889.

Graaf, Regnier de, a Dutch physician and anatomist, was born at Schoonhoven, 30th July 1641, studied at Leyden under Dubois (De le Boé), better known as Sylvius, and afterwards in France, taking the degree of doctor of medicine at Angers in 1665. The year after he settled at Delft, where he practised until his death, 17th August 1673. In 1663 he wrote *Disputatio Medica de Natura et Usu Succi Pancreatici*, which gained him a great reputation. In the course of his investigations in abdominal anatomy he discovered, in 1672, the Graafian vesicles or follicles of the female ovum (see Ovary). He wrote several dissertations on the organs of generation in both sexes, which involved him in a prolonged and angry controversy with Swammerdam. His *Opera Omnia* were published at Leyden in 1677, and republished in 1686 and 1705.

Graafian Vesicles. See Ovariotomy.

Graaf-Reinet, a town of Cape Colony, nearly girdled by the Sunday River, 185 miles N. of Port Elizabeth by rail. Founded in 1784, it still preserves the quaint and simple characteristics of the old Dutch town; and with its vineyards, orchards, and gardens, in contrast to the burning karroo plains that encircle it, it has been well called 'the gem of the desert.' The streets are wide, with rows of oak, orange, and other trees, and broad channels of running water; the houses white, with overhanging thatches and broad 'stoeps.' Behind it the Sneeuwberg Mountains rise to a height of 1000 to 1500 feet. Pop. 6000.—The division of the same name has an area of 3792 sq. m., and a population of about 17,000.

Gracchus, the name of a Roman family, of the gens Sempronia, which contributed several famous citizens to the state: (1) Tiberius Sempronius, a distinguished opponent of Hannibal in the second Punic war, who fell in battle against Mago, 212 B.C., and was honoured by Hannibal with a splendid funeral. (2) Tiberius Sempronius, the father of the two tribunes whose fame has overshadowed all the others. He was born about 210 B.C., filled successively all the high offices of state, conquered the Celtiberi, and by his kindly treatment of the Spaniards earned their lasting gratitude. He married Cornelia, the youngest daughter of P. Scipio Africanus, who bore him twelve children, of whom all died in youth save a daughter, Cornelia, who married P. Scipio Africanus the younger, and the two illustrious sons whose history follows.

Tiberius Sempronius Gracchus was born about 168 B.C., and was educated with great care by his excellent mother, his father having died while he was yet very young. He was already a distinguished soldier when in 137 he served as quæstor to the army of the consul Mancinus in Spain, where the remembrance of his father's honour, after forty years, enabled him to gain better terms for the 20,000 Roman soldiers who lay at the mercy of the Numantines. But the peace was repudiated at Rome, and Mancinus was stripped naked and sent back to the Numantines, as if in that way the treaty could be rendered void. The hopeless poverty in which thousands of the Roman citizens were sunk now began to weigh upon the mind of Gracchus, and ere long he plunged into an agitation for reform to which he was soon to sacrifice his life. Elected tribune of the people in 133, he endeavoured to reimpose the agrarian law of Licinius Stolo, and after violent opposition on the part of the aristocratic party, who had bribed his colleague M. Octavius Cæcina, he succeeded in passing a bill to that effect. Tiberius Gracchus, his brother Caius, and his father-in-law Appius Claudius were appointed triumvirs to enforce its provisions. Meantime Attalus, king of Pergamus, died, and bequeathed all his wealth to the Roman people. Gracchus therefore proposed that this should be divided among the poor, to enable them to procure agricultural implements and to stock their newly-acquired farms. It is said that he also intended to extend the franchise, and to receive Italian allies as Roman citizens. But fortune turned against the good tribune. He was accused of having violated the sacred character of the tribuneship by the deposition of Cæcina, and thousands of the fickle mob deserted their champion and benefactor. The selfish and unscrupulous aristocrats formed a ring for his destruction, a bad eminence in which belonged to P. Corn. Scipio Nasica. In the midst of the next election for the tribuneship Tiberius Gracchus with some hundreds of his friends was foully murdered.

Caius Sempronius Gracchus was nine years younger than his brother, and had greater natural powers and wider aims. His brother's death occurred while he was serving in Spain under Scipio Africanus, and deterred him for some years from entering into public life, but at length he unexpectedly returned to Rome, urged by his brother's shade to take up his mission. He stood for the tribuneship, and was elected in 123, and a second time the year after. His first measure was to renew his brother's agrarian law, which had by the machinations of the nobles been kept in abeyance. With passionate earnestness he devoted himself to the cause of the poor, whose immediate misery he relieved by employing them upon new roads throughout all parts of Italy. But not all his noble devotion to the real good of Rome could save him from his brother's fate. By an intrigue of the senatorial party his colleague M. Livius Drusus was bribed to undermine the influence of Caius by far surpassing him in the liberality of his public measures, and by his benefits to the commons, and consequently Caius was rejected from a third tribuneship. At the expiry of his term the senate began to repeal his enactments. Caius appearing in the Forum to make opposition, a fearful riot ensued, in which it is said as many as 3000 of his partisans were slain. Caius held aloof from the fight, but was at length compelled to seek safety in flight. He escaped to the grove of the Furies with a single slave, who first slew his master and then himself. The people

saw too late the folly of which they had been guilty in abandoning their best friend in the hour of need, and endeavoured to atone for their crime by erecting statues to the two brothers, by declaring sacred the spots where their blood had been shed, and by offering sacrifices to them as to deities. Their mother survived them long, and upon her tomb the Roman people inscribed the words, 'Cornelia, mother of the Gracchi.' See the articles AGRARIAN LAWS and ROME.

Grace, in theology, is general or special.—*Common* or *general* grace denotes the love which God has to all his creatures, and the light of nature and of conscience which they all enjoy. *Special* or *particular* grace is the love which God has for his elect people, and by which he saves them from their sins. Special or saving grace is spoken of as electing, justifying, sanctifying grace; also as *imputed* grace—the grace of Christ's righteousness imputed to those that believe on him. Grace is further efficacious and irresistible; and elect or believing people are said to stand to God in the covenant of grace, Adam's relation to his Maker before the fall being the covenant of works. When man is said to be in a state of *grace*, it implies that he is in the enjoyment of this divine love and favour. St Paul draws a sharp contrast (Rom. xi.) between 'grace' and 'works.'

Grace at Meals was the custom of the Jews; and Our Lord 'blessed' or 'gave thanks' before distributing the loaves and fishes, and again before and after the Last Supper. That it was the general practice of the early Christians to give thanks, seemingly at every meal, is evident from the writings of St Paul and of the Fathers. The Gelasian Sacramentary (end of 5th century) contains probably the most ancient graces of the Latin Church now extant. At Clifford's Inn the 'acted grace' consisted in the raising three times, in allusion to the Trinity, of four loaves, representing the four gospels, which the president then propelled along the polished tables to the vice-chairman, to symbolise the spread of the gospel to the heathen. The canon *Non Nobis, Domine* by William Byrd (q.v.) is often sung in England at public dinners in place of a grace after meat. The old college grace, 'Benedictus benedicat,' and, after dinner, 'Benedicto benedicatur,' may also be mentioned.

Grace, WILLIAM GILBERT, cricketer, was born 18th July 1848, at Downend near Bristol, fourth son of the village doctor; was a very distinguished cricketer by 1864, and soon was by far the foremost of cricketers, not merely playing in the great matches at home but making cricketing tours in Canada and the United States (1871), and Australia (1873). He studied medicine mainly at Bartholomew's Hospital (1875–78), and took L.R.C.P. at Edinburgh in 1879, whereupon he settled in practice at Bristol—finding time also for many a brilliant exhibition of his favourite game. He received a testimonial of £1400 in 1879, and in 1895, when he received one of over £5000, he had scored a century a hundred times. He published *Cricket* in 1891, and resigned the captaincy of the Gloucestershire eleven in 1899. His four brothers, all doctors, were also famous cricketers, especially George Frederick (1850–80). See his *Cricketing Reminiscences* (1899).

Gracedieu, a village 5 miles NE. of Ashby-de-la-Zouch, with ruins of a nunnery and the manor where Francis Beaumont (q.v.) was born.

Gracehill, a village with a Moravian settlement (1746) 2 miles SW. of Ballymena.

Graces (Lat. *Gratiæ*, Gr. *Charites*) divine personifications of grace, gentleness, and beauty, usually described as daughters of Zeus, who are given by Hesiod as three in number: Aglaia, Thalia, and Euphrosyne. The earliest conception seems to have been but one aspect of Aphrodite; the division into a plurality of beings came later. Originally the Lacedemonians had only two Charites, Cleta and Phaënna; the Athenians also had but Hegemone and Auxo. In the early ages the graces were represented in elegant drapery; at a later period slightly draped, or entirely nude, usually holding each other by the hand, or locked in each other's embrace.

Grackle. See GRAKLE.

Gradient, a term used chiefly in connection with railways to signify a departure of the line from a perfect level. See RAILWAY, ROAD.

Gradisca, a town of Austria, on the Isonzo, 25 miles NW. of Trieste. First fortified by the Venetians in 1478, Gradisca, with its territory, came into the hands of Austria in 1511, and during the next century and a half figured frequently in the wars between Austria and Venice. In 1647 it became a principality of the empire, but lapsed to the imperial crown again in 1717, and in 1754 was united to Görz (q.v.). Pop. 1464.

Gradual, an antiphon, introduced into the service of the Mass in the 5th or 6th century, sung after the epistle, and so called either from the altar-steps (*gradus*), where it was formerly sung, or because it was sung while the minister ascended the steps of the Ambo (q.v.) where the gospel was read. From Septuagesima to Holy Saturday the 'alleluia' with which the gradual is followed is replaced by a mournful chant called the *Tract*. The words of the gradual are nearly always taken from the Psalms; and they are invariably sung to 'plain chaunt' melodies, the compositions under this title of Haydn, Mozart, and others being graduals in name only. These melodies are contained in the *Gradual* (Old Eng. *Graile*), a volume of ritual music intended chiefly for the choir, and containing all the plain chaunt melodies appointed for the service of mass throughout the year.

Gradual Psalms, or SONGS OF DEGREES, a name given both by the Hebrews and in the Christian service-books to the fifteen psalms, 120–134 (119–133 in the Vulgate). The origin of this name is uncertain. The oldest explanation makes it an allusion to the fifteen steps between the courts of the temple, on each of which a later rabbinical tradition asserts that one of the psalms was sung; and others, again, have regarded these psalms either as containing a prophetic allusion to the return from captivity, or as having been sung in the 'going up' from Babylon. But the tradition has no support apart from the Talmud, and carries a suggestion of having been invented to meet the case; while the plural number of the title, 'goings up,' is against the second explanation. A third conjecture, which has more to recommend it, supposes that the psalms were sung by pilgrims when going up to Jerusalem for the great annual feasts. In the Roman Catholic Church they are recited on all Wednesdays in Lent, except the last.

Graduation. By the term graduation is meant those processes by which linear scales and circles, or circular arcs, are divided into any required number of parts. Such methods are constantly employed in the division of the scales of barometers, thermometers, cathetometers, reading arcs or circles of theodolites, sextants, telescopes, mural circles, spectroscopes, and in many other instruments where precision and accuracy of measurement is necessary. Since any mechanical process for executing such division must be preceded by some independent original graduation of the mechanical instrument itself, it is obvious that all methods of graduation must ultimately depend upon some original graduation. The subject may

therefore be considered first in reference to *original* graduation; and afterwards the reproduction, by hand or machine, of originally graduated lines or arcs may be dealt with.

The most elementary process in original graduation is the operation of dividing a line into a given number of equal parts. Let AB (fig. 1) be a line: it is required to divide it into, say, seven equal parts. From A draw AC, making any convenient angle with AB, and on AC lay off with compasses or a scale seven equal distances from A. Join BD, supposing D to be at the end of the seventh part on AC, and through the other points of division of AC draw lines parallel to BC. These will cut AB into seven equal parts. In practice, however, this method is not very accurate and is not often employed. In another method, that known as *continual bisection*, the length of half the line is laid off, by means of the beam-compass, from both ends; these lengths from the two ends should agree in one point as being the middle point of the line; if they do not, then the point midway between them is taken as being the middle point, and is found by means of a pair of fine compasses and a lens. Each half of the line is, by the same means, halved again, and so on until the required number of divisions is obtained. Similar division of a straight line may be obtained by laying off, by a pair of spring-dividers, one after another, from one end of the line, the smallest part required. Obviously, if there is any error in the first distance thus laid down, it will be multiplied in the last in proportion to the whole number of divisions. This method is known as *stepping*.

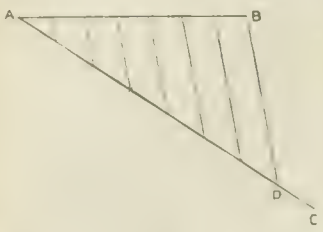


Fig. 1.

The original graduation of circles or of circular arcs is a matter of some difficulty, as it requires on the part of the operator such skill, patience, and care as is possessed by few. In this connection the names of Graham, Bird, Troughton, Ramsden, and Simms may be mentioned as those whose work has been of high value to the astronomer and physicist. The first method which may be described by which a circle can be divided is practically the same as that of bisection in the case of the straight line. Since the chord of an arc of 60° is equal to the radius of the circle (the chord and two radii to its extremities forming an equilateral triangle), if this length be laid off from any point on the circle an angle of 60° is thereby determined. The half of this angle may be obtained, and when added to 60° forms the quadrant or 90°. Continual bisection of 60° gives the smaller divisions of degrees and fractions of a degree. Troughton's method depends on an entirely different principle. A cylindrical roller is employed, whose dimensions are such that in rolling on its axis once round the outside edge of the circle it revolves sixteen times. The edge of the roller is itself divided into sixteen equal parts by repeated bisection. It is then held firmly by a frame against the edge of the circle, so that, on being moved always tangentially to the circle, it revolves on its axis round the edge of the circle. In doing so marks are made on the edge of the circle corresponding to the divisions on the roller; of these there will be 256, each interval being equal to 84⅜ minutes of arc. The further division of these intervals into degrees and minutes is effected by means of a subdividing sector, placed concentrically, and rolling with the roller. For the details of the manipulation of this sector reference may be made to Troughton's paper in the *Philosophical Transactions*, 1809.

The reproduction, or *copying* as it is termed, of graduated straight scales, circles, or circular arcs, by copying them from patterns originally graduated with great accuracy, may be done by hand or by mechanical contrivances. In copying a straight scale the 'work'—i.e. the piece of metal or other material whose division is required—is laid parallel to and flat with the pattern whose graduation is copied. A straight-edge is laid across both, so as to coincide with one of the divisions in the pattern, and the dividing-knife is drawn carefully along the edge, and across the work. In copying circles the work is screwed firmly down on and concentric with the pattern; the dividing-knife is then used in the same manner as in copying straight scales, being guided by an index steel bar, the edge of which is exactly coincident with a radius of the circle.

Copying is now more usually effected by instrumental means, the machines for this purpose being the linear and circular dividing-engines. In the linear dividing-engine the principal part is a carefully turned screw, which revolves in bearings in two supports. Connected with the screw is a crank handle and a disc whose plane is perpendicular to the axis of the screw, and whose flat edge is divided into a number, usually 400 or 500, of equal parts. As the handle is turned the screw rotates, but does not move in the direction of its length (it may, therefore, for distinction be referred to as the fixed screw). At the same time the disc also revolves, and each division on its edge passes an index line on a part of the support close to it; the number of complete turns and fractions of a turn of the screw may thus be easily counted. If, now, the fixed screw pass through a hollow travelling nut or screw, the latter will move backwards and forwards according as the fixed screw is rotated one way or the other. Thus, e.g., if the 'pitch' of the fixed screw be one millimetre, and the handle be turned ten times and a little more, corresponding to fifty-six divisions (of which let there be 500) on the graduated edge of the disc, the travelling-screw, and anything there may be in connection therewith, will advance through $10\frac{56}{500}$ mm.—i.e. 10·112 mm. The handle is so connected with a ratchet-wheel that the fixed screw can only be rotated in one direction, so that the travelling-screw can only travel in one direction, usually from left to right. Attached to the travelling-screw is the dividing-apparatus, which is a light frame supporting a vertically-placed steel needle, with a fine, hard point, and capable of a to-and-fro motion in a horizontal line at right angles to the fixed screw. This needle serves as a marker whereby divisions may be made on any object whose graduation is desired. For instance, to divide a given length into a certain number of equal parts, the travelling-screw is allowed to advance, by turning to the requisite amount, so that the point of the needle, starting from one end of the line, moves through a distance equal to one of the equal parts. A mark is then made with the needle; the travelling-screw is again advanced through precisely the same distance, and another mark is made; this process is continued until the whole length is divided. The length of mark made by the steel point may be adjusted, within certain limits, by increasing or decreasing, by screws, the range of the marking-point. In addition to this, however, it is desirable in some cases to make every tenth mark longer than the others, excepting the fifth, which may be intermediate. This is effected by a wheel whose circumference is cut up by rectangular notches, into

which one part of the frame holding the needle fits when at the end of its possible range of motion; every tenth notch being deeper than the others (except the fifth as above), the range of marking is longer in this case than the others. This wheel is turned by ratchet-work in the to-and-fro motion of the marking-point. The carriage attached to the travelling-screw may also support a small reading microscope: thus the linear dividing-engine may be used to test with great accuracy the distance between two points, each lying at the intersection of the cross-wires in the field of view; all that is necessary is to focus one of the points, count the number of whole and fractional turns of the screw required to bring the second point into focus, and thus the distance may be obtained.

For the purpose of dividing circles the circular dividing-engine is employed. This instrument was first constructed by Ramsden, afterwards improved by Troughton, and more recently by Simms. The essential features of a circular dividing-engine are a circular plate carefully divided by original graduation, and capable of rotation on its axis; a tangent-screw, working in a ratched edge of the circle, and thus capable of turning it through any required angle; a dividing-knife worked radially, so that, when the tangent-screw turns the circle through successive equal angles, radial lines may be drawn on any work laid on the divided circle. Fig. 2 represents one form of the instrument. A, A is the circle, usually 4 or 5 feet in diameter, divided at its edge, and ratched into teeth at its lower edge, C. The axis of the circle is in the column, E. TT′ is the tangent-screw; T′, a handle for turning it; T, a disc-shaped head, the divisions on the circumference of which allow of the number of whole and fractional turns of the screw being counted. The carriage, D, in which works the dividing-knife (not seen in the figure), may be adjusted to different heights by the screws on the pillars, P, which support the parallel beams on which the dividing-knife carriage moves; it may also be adjusted to circles of different radii by moving the carriage along these beams to the requisite amount from the centre. When in action the tangent-screw is pressed against the ratched edge of the circle by a handle, K, with an eccentric knob. This pressure may, of course, be relieved when the screw is not in use. The tangent-screw is sometimes turned by a treadle, or even by clock-work. Its pitch being accurately known, the angle through which the circle turns, due to one revolution of the tangent-screw, as noted by the divided head, T, is determined once for all for any machine. The work to be divided is fixed down on and concentric with the circle, A; a mark is made as origin with the dividing-knife, the tangent-screw is then made to turn the circle through one of the smallest divisions, and another mark is made; another equal turn of the screw is made and another mark cut on the circle, and so on until the division of the whole circle is completed. This is the method by which the large circles used in astronomical instruments are graduated, and such is the perfection to which these have been brought that the circular dividing-engine may be looked upon as being one of the most perfect of scientific measuring instruments.—For graduation in universities, see DEGREES, UNIVERSITY.

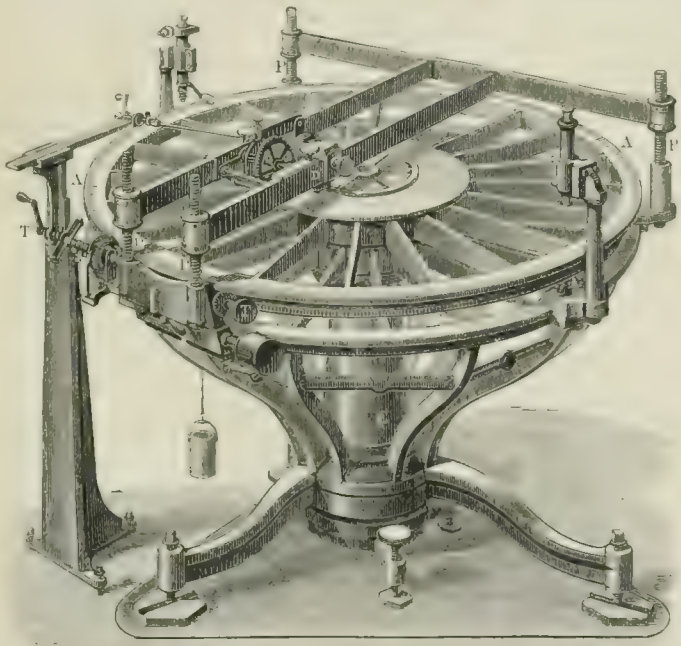


Fig. 2.—Dividing-engine.

Gradus ad Parnassum (Lat., 'a step to Parnassus'), a dictionary of prosody used in making Latin and Greek verse. The best known is the Latin one by John Carey, LL.D. (1756–1826), teacher of the classics and author of school-books, which was published in 1824.

Græcia. MAGNA. See MAGNA GRÆCIA.

Graetz, HEINRICH, Jewish theologian, was born in 1817 at Xions in Posen, and studied at Breslau, where in 1854 he became teacher in the Jewish seminary, and in 1870 also extraordinary professor in the University. He died 7th September 1891. He wrote commentaries on Ecclesiastes, Song of Solomon, Joel, the Psalms, and a work on Gnosticism and Judaism; but is remembered by his great *Geschichte der Juden* (11 vols. 1853–75; 4th ed. 1892; abridged in 3 vols. 1888–89 and translated in 5 by Bella Löwy in 1891–92).

Graf, ARTURO, Italian poet of German extraction, was born at Athens in 1848, spent his youth in Roumania, studied law at Naples, and in 1874 began to lecture on law in the University of Rome. Meanwhile he became eminent as a poet, has published several volumes of verse, and numerous works on literary history, myths, legends; and since 1882 is Professor of Italian literature at Turin.

Graf, HEINRICH, professor of theology at Leipzig, studied under Reuss at Strasburg, and died 16th July 1869. His name is identified with the theory of the Pentateuch taught by Reuss in 1833 that the 'Priestly Document' of the Pentateuch was written after the exile. See PENTATEUCH.

Gräfenberg, a village in the north-west corner of Austrian Silesia, 50 miles N. of Olmütz. It is celebrated as the spot where the water-cure (see HYDROPATHY) was introduced in 1826 by Vincenz Priessnitz (1799–1851). It still is visited yearly by some 1500 persons.

Graffiti (Ital. *graffito*, 'a scratching'), or WALL-SCRIBBLINGS, the name given to certain classes of mural inscriptions and drawings found at Pompeii, Rome, and other ancient cities in Italy. They are generally scratched, with a stylus or similar sharp instrument, or scrawled, with red chalk or charcoal, on walls, door posts, and portico pillars, and seem to be the work of idle schoolboys, loungers, trifflers, and the like 'do-nothing' folk; but some were executed with more serious intention. Accordingly we find that the subjects that oftenest occur are doggerel verses, quotations from the poets, amatory

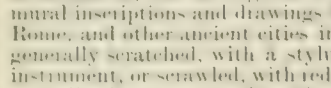


Fig. 1.—Specimen of Graffiti—*Auge amat Arabienum* ('Auge is in love with Arabienus').

effusions, names with opprobrious epithets attached, coarse and often obscene words and figures, rude caricatures, especially of gladiators, of which fig. 2 is a specimen, and other instances of the thousand and odd ways in which the impulses of the restless idler prompt him to express his fancies. Amongst the more serious examples there are electioneering admonitions, playbills, and similar public announcements, philosophic apophthegms, notices of household events, time-tables of domestic work, and exclamations and sentences of even tragic import. These scribblings and rude drawings derive importance from the fact that, like *Punch* and similar comic journals, they serve as an admirable index to the current life of the people, especially in Pompeii, where the greatest number of them have been discovered. Without them we should have a far less adequate idea of the street-life of the ancient Roman people. They also throw much light upon the phraseology and idiom of the vernacular spoken towards the end of the 1st century A.D. in the cities of southern Italy. Three languages, or rather three alphabets, were used Latin, Greek, and Oscan. Of these Latin was much the most commonly employed. In Rome *graffiti* have been found on some of the great buildings of the ancient city, as the Palace of the Cæsars, Nero's Golden House, and tombs on the Via Latina, as well as in the Catacombs. These last consist for the most part of lists of mere names, pious prayers and wishes, and invocations to the martyrs. The first collection of *graffiti* from Pompeii was published by Bishop Christopher Wordsworth in 1837, and is reprinted in his *Miscellanies* (1879). All that have been discovered and published up to the present time are to be found in vol. iv. of *Corp. Inscr. Lat.* (1871, edited by Zangemeister under the title *Inscriptiones Parietariæ Pompeianæ, Herculanenses, et Stabianæ*) and the supplementary volume. The inscriptions in the Oscan characters, of which there are two varieties, as there likewise are of both the Greek and the Latin, are not contained in the collections just quoted; but they will be found in Fiorelli's *Inscr. Oscarum Appographa* (1854). Compare also Garrucci's *Graffiti de Pompei* (Paris, 1856), and *Edinburgh Review*, vol. cx.

Fig. 2.—Gladiator.

Gräfrath, a town of Rhenish Prussia, 12 miles E. by S. of Düsseldorf, with cotton and iron manufactures. Pop. 6699.

Grafting, a mode of propagation applicable to all kinds of trees and shrubs, and even herbaceous plants whose tissues are firm. The operation consists in the inserting of a branch or bud (*scion*) of one tree into some part of another tree (*stock*), so as to bring about a union of the two. The practice of grafting is doubtless one of great antiquity, and its origin may in all probability be traced to a natural process which is of frequent occurrence. It has been observed that, when two branches of a tree or branches and even the stems of kindred trees growing closely together overlap and touch each other, the bark becomes wounded or abraded, and the returning juices exuding from the ruptured vessels in the *Alburnum* (q.v.) produce granulations by which a perfect incorporation of structure is effected, and the parts become one. The object of grafting is, first, to perpetuate and increase the stock of varieties and sub-varieties of fruit-trees, the innate qualities of which cannot be transmitted with certainty to their progeny by seeds, and which would be more slowly and less surely multiplied by any other artificial mode of propagation; secondly, to increase and accelerate the fruitfulness of fruit trees—for, the elaborated sap being impeded in its descent at the junction of the scion with the stock, the process of maturation is thereby promoted, and fertility more largely and quickly induced. Old and unfruitful trees, whose stems and roots are vigorous and healthy, may be rendered fruitful in the course of two or three years by having their tops cut back and re-grafted with scions from a fruitful and healthy tree. Grafting is also employed for the purpose of dwarfing fruit-trees, while at the same time abnormally increasing their fruitfulness. This is attained partly by the selection of a stock which exerts a restrictive influence on the scion, and by double grafting—i.e. grafting twice or oftener at will. Very young trees are thus rendered prodigiously fruitful, and are in demand for the purpose of pot culture and planting in orchard-houses. Trees damaged by wind or otherwise have their injuries repaired by grafting, and those that are unequally balanced may be brought to perfect symmetry by the judicious insertion of scions in the ill-furnished parts.

In grafting it is particularly to be attended to that the *alburnum* of the scion is brought into contact with that of the stock. The hard wood of the one never unites with that of the other, remaining separate and marking the place of the operation even in the oldest trees. For scions or grafts, pieces of about six to eight inches long are generally taken from the shoots of the previous summer, with several buds; but portions of shoots of two years old are sometimes successfully employed. The time for grafting is in spring, as soon as the sap begins to appear. The scion should, if possible, be taken from a healthy and fruitful tree, but scions from the extremities of lateral branches are more likely to become speedily fruitful than those from the uppermost branches, where growth is most vigorous. The scion should be kept for a few days before grafting, so that the stock may rather exceed it, not only in vigour, but in the progress of its spring growth; and for this purpose it may be placed in the ground, in a rather dry soil, sheltered from the direct rays of the sun. Scions may be kept for some time, and easily carried to a distance,

by sticking their lower end into a potato or moist moss or clay. The end should always be freshly cut off when the scion is to be used. There are various modes of grafting. *Cleft-grafting* (fig. 1) is very commonly practised when the stock is very considerably thicker than the scion. The stock, being cut over, is cleft down, and the graft, cut into the shape of a wedge at its lower end by a sharp thin knife, is inserted into the cleft. This mode of grafting is particularly applicable to branches of large trees, when the introduction of a new variety of fruit or increased fruitfulness is sought.—*Crown-grafting* is used for still thicker stocks, which are cut across, and then cleft down by two clefts crossing one another at right angles, two scions being inserted close to the bark in each cleft; or no cleft at all is made, and any desired number of scions obliquely cut away on one side are simply inserted between the bark and wood of the stock, the operation in this case being deferred till the bark readily parts from the wood. In this kind of grafting a longitudinal slit in the bark of the stock, opposite to each graft, is advantageous. — *Tongue-grafting* (fig. 2) is the mode most commonly practised for young trees in nurseries. For this it is necessary that the stock and the scion should be of not very different thickness. A slit or a very narrow angular incision is made in the centre of the stock downwards, and a similar one in the scion upwards, both having been first cut obliquely at corresponding angles; and, the tongue thus made in the scion being inserted into the incision in the stock, they are fastened very closely and thoroughly together. In *saddle-grafting* the end of the stock is cut into the form of a wedge, and the scion is affixed to it, the base of the scion having been cut or slit up for the purpose.—*Shoulder-grafting*, used chiefly for ornamental trees, is performed by cutting obliquely, and then cutting across a small part at top of the stock, so as to form a shoulder, the scion being cut to fit it.—*Peg-grafting*, not now much in use, is accomplished by making the end of the scion into a peg, and boring the top of the stock to receive it.

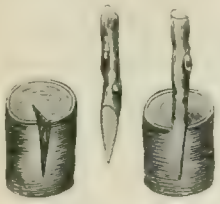


Fig. 1.—Cleft-grafting.

Fig. 2.
a, tongue-grafting; *b*, do. with ligature applied; *c*, do. with clay applied.

Whichever of these modes of grafting is adopted the graft must be fastened in its place by tying, for which purpose a strand of bast-matting is commonly used. The access of air is further prevented by means of clay, which has been worked up with a little chopped hay, horse or cow dung, and water, and which is applied to the place of junction so as to form a ball, tapering both upwards and downwards. In France a composition of 28 parts black pitch, 28 Burgundy pitch, 16 yellow wax, 14 tallow, and 14 sifted ashes is generally used instead of clay. The progress of the buds shows the union of the graft and stock, but it is not generally safe to remove the clay in less than three months; and the ligatures, although then loosened, are allowed to remain for some time longer. From some kinds of fruit-trees fruit is often obtained in the second year after grafting.

Budding (q.v.) is in principle the same as grafting; and *flute-grafting* is a kind of budding in which a ring of bark with one or more buds is used instead of a single bud, and, a stock of similar thickness having been cut over, a corresponding ring of bark is removed, and the foreign one substituted. This is commonly performed in spring, when the bark parts readily, and is one of the surest modes of grafting.—*Inarching* or *grafting by approach*, in which the scion is not cut off from its parent stem until it is united to the new stock, is practised chiefly in the case of some valuable shrubs kept in pots, in which success by the ordinary methods is very doubtful.

An effect is produced by the stock on the scion which it nourishes analogous to that of a change of soil; much of the vigour of a strong healthy stock is also communicated to a scion taken even from an aged tree. There is, moreover, in some degree, an influence of the elaborated sap descending from the scion on the stock which supports it. An important part of the practical skill of the gardener or nurseryman consists in the selection of the proper kinds of stocks for different species and varieties of fruit-trees. The stock and scion, however, must not be of species extremely dissimilar. No credit is due to the statements of ancient authors about vines grafted on fig-trees, apples on planes, &c., the semblance of which can only have been brought about by some delusive artifice; for all attempts at grafting fail except among plants of the same genus, or at least of the same natural family.

Herbaceous plants with firm stems, as dahlias, are sometimes grafted. Some kinds of plants, of small size, in pots, are placed in moist hothouses or hotbeds, under bell-glasses, whilst the junction of the scion and stock is going on, which in these circumstances takes place very surely and very expeditiously. But an accumulation of too much moisture under the bell-glass must be guarded against.

Grafton, a rising town of New South Wales, 350 miles NE. of Sydney, situated on both sides of the Clarence River, and 45 miles from the sea. The river is navigable. The agricultural district yields sugar and tobacco; and gold, silver, coal, and copper are found. Pop. 4770.—Grafton is also a town of 5000 inhabitants, 9 miles SE. of Worcester in Massachusetts; and of a railway centre (pop. 3100) in West Virginia, 99 miles SE. of Wheeling.

Grafton, Augustus Henry Fitzroy, Duke of, statesman, a descendant of Charles II., was born 1st October 1735, and in 1757 succeeded his grandfather, the second duke (see Charles II.). He first came to the front in political life in 1763 in the opposition to Bute, and in July 1765 he took office as Secretary of State under Rockingham, but resigned in the following May. Two months later Pitt became premier and Earl of Chatham, making Grafton First Lord of the Treasury; but in consequence of Chatham's continued illness Grafton was compelled to take upon his own shoulders the responsible duties of head of the government from September 1767. He resigned in 1770, accepted the office of Lord Privy Seal under Lord North in 1771, and filled it until November 1775. When the new Rockingham ministry was formed in March 1782 Grafton took his old post as Lord Privy Seal, but resigned office thirteen months later. He died at Euston Hall, Suffolk, 14th March 1811. Indolent, vacillating, somewhat obstinate in his political life, and openly immoral in his private life, Grafton was the target at which Junius (q.v.) shot some of his sharpest invectives.

Gragnano, a town of Italy, 20 miles by rail SE. of Naples, with manufactures of wine and macaroni. Pop. 8611.

Graham, the name of an illustrious Scottish family of Anglo-Norman origin, who settled in Scotland during the 12th century. A Sir William de Graeme received from David I. the lands of Abercorn and Dalkeith, and extensive grants of estates were made to his descendants by William the Lion, Alexander II. and III., and by King Robert Bruce. One of their chiefs, Sir John de Graham of Dundaff, was the bosom friend of the patriot Wallace, and was killed at the battle of Falkirk, July 22, 1298. From the war of independence downwards the Grahams have taken a prominent part in the public, and especially in the warlike, affairs of the country. Patrick Graham of Kincardine was made a peer in 1451 under the title of Lord Graham. His grandson was created Earl of Montrose by James IV. (1504–5), and fell with his sovereign at the battle of Flodden. The third earl twice held the office of High Treasurer of Scotland, and was appointed Lord Chancellor in 1599. On resigning that office he was appointed Viceroy of Scotland for life. His grandson, the fifth earl and first Marquis of Montrose, is the glory of the House of Graham (see MONTROSE). His eldest surviving son, who was born in 1631 and died in 1699, was termed the 'Good Marquis.' He was peculiarly amiable in his disposition, and delighted in the quiet and peace of private life. The fourth marquis was appointed High Admiral of Scotland in 1705 and President of the Council in 1706. He was a firm supporter of the union between England and Scotland, and was created Duke of Montrose in 1707. He held the office of Keeper of the Privy Seal under Queen Anne (1709–13), was appointed Secretary of State for Scotland by George I. in 1717, and a second time Keeper of the Great Seal in Scotland. He was Chancellor of the university of Glasgow, and died in 1742. His grandson, the third duke, held in succession, under the ministry of William Pitt, the offices of one of the Lords of the Treasury, Paymaster of the Forces, one of the Commissioners of the Indian Board, Master of the Horse, Lord Justice-general of Scotland, President of the Board of Trade, and Joint Paymaster of the Forces. He was also, like his father, Chancellor of the university of Glasgow, and Lord-lieutenant of the counties of Stirling and Dumbarton, in which he had great influence. 'Few individuals,' says Sir Nathaniel Wraxall, 'however distinguished by birth, talents, parliamentary interest, or public services, have attained to more splendid employments, or have arrived at greater honours.' He died in 1836. The fourth duke was Lord Steward of the Household, Chancellor of the Duchy of Lancaster, and Postmaster-general. He died in 1874. The family honours and estates were then inherited by his third and only surviving son, the fifth duke. It is noteworthy that the title of the family is not taken from the town of Montrose, but from their hereditary estate of 'Auld Montrose,' which David Graham received from Robert Bruce in exchange for the lands of Cardross in Dumbartonshire.—The Grahams of Fintry, Duntrune, Inchbrakie, Esk, Menteith, Netherby, and Norton Conyers are minor branches of the family. See Dr James Taylor's *Great Historic Families of Scotland* (1887).

Graham, DOUGAL, the literary bellman of Glasgow, was born in the village of Raploch, near Stirling, about 1724. He was a hunchback, and from an early age laboured irregularly as a farm-servant. He followed Prince Charlie's army on its southern march to Derby, apparently as a kind of sutler, and made his way home soon after the disaster at Culloden. Five months later he had his metrical narrative ready, which, grotesque and pitiful doggerel as it is, has no mean value as a record of the fresh observations of an honest and not unintelligent eye-witness. Soon after this he took up his abode in Glasgow, where his ready wit soon made him something of a public character, but he still plied his calling as a prosperous chapman or pedlar. Here also he made himself the poetical chronicler of passing events, and wrote many of the chap-books which he sold, and which quickly became extraordinarily popular. He was appointed 'skellat' bellman (for ordinary announcements) of the city, not earlier than 1770; but there is no mention of his name in the town-council records. He died 20th July 1779. Many of his rambling ballads and prose chap-books were anonymous, and are now impossible to trace; of the former the best known are *John Highlandman's Remarks on Glasgow* and *Turnimspike*. His numerous prose chap-books are both humorous and good-humoured, but never touch the region of the literary, and are moreover disfigured by a constant coarseness and by occasional grossness of obscenity which admit of no extenuation.

The most popular were *The Whole Proceedings of Jockey and Maggy, Paddy from Cork, Lothian Tom, The History of John Cheap the Chapman, the Comical and Witty Jokes of John Falkirk the Merry Piper, Leper the Tailor, John Falkirk's Cariches, Comical History of Simple John and his Twelve Misfortunes,* and *George Buchanan*. Both Scott and Motherwell meant to have edited some of Dougal Graham's work. This was finally done in a complete edition in two handsome volumes by George MacGregor (Glasgow, 1883).

Graham, SIR JAMES ROBERT GEORGE, English statesman, was born at Netherby, in Cumberland, June 1, 1792, and educated at Westminster and Queen's College, Cambridge. As private secretary to the British minister in Sicily in 1813, he had a hand in the negotiations with Murat at Naples. After his return for Carlisle as a Whig in 1826 he became a warm supporter of Catholic emancipation and a zealous advocate of the Reform Bill. Earl Grey thereupon offered him, in 1830, the post of First Lord of the Admiralty, with a seat in the cabinet. But in 1834 he seceded from the government, disagreeing with his colleagues on the appropriation clause of the Irish Church Temporalities Act; and, going over to the Conservatives, became in 1841 Home Secretary under Sir Robert Peel. In 1844 he issued a warrant for opening the letters of Mazzini, and caused the information thus obtained to be communicated to the Austrian minister, an act by which the ministry, and Graham in particular, incurred great obloquy. He also encountered great displeasure north of the Tweed by his high-handed method of dealing with the Scottish Church during the troubles which ended in the Disruption and the formation of the Free Church. He gave Peel warm support in carrying the Corn Law Repeal Bill, and resigned office (1846) with his chief as soon as that measure was carried. On the death of Peel in 1850 he became leader of the Peelite party in the Lower House, and in December 1852 took office in the Coalition Ministry as First Lord of the Admiralty. He retired from official life in February 1855, and died at Netherby, October 26, 1861. See Life by Torrens (2 vols. 1863) and by Lonsdale (1868).

Graham, JOHN, VISCOUNT DUNDEE, was the elder son of Sir William Graham of Claverhouse, in Forfarshire. His birth is placed with more likelihood in 1649 than in 1643, for he did not matriculate at St Andrews till February 1665. After three years there, then four perhaps soldiering under Turenne, in 1672 he entered the Dutch service as cornet in the Prince of Orange's horse-guards. In 1674 at the battle of Seneff he saved (according to the *Grameid*) William's life; in 1677

he returned to Scotland, and next year received a commission as lieutenant in a troop of horse commanded by his cousin, the third Marquis of Montrose. At this time the government of Charles II. was engaged in its insane attempt to force Episcopacy upon the people of Scotland. A system of fines and military coercion was carried on against all nonconformists; conventicles and field-preachings were prohibited; penalties were inflicted on all who even harboured the recusants; and the nation lay at the mercy of informers. Maddened by oppression, and fired by a fierce zeal for the Covenant, the western peasantry flew to arms; but their efforts were irregular and detached, and each successive failure only aggravated their sufferings. Many were executed; the gaols were crowded with prisoners; and those who fled were outlawed, and their property confiscated. In this miserable service Claverhouse, now sheriff-depute of Dumfriesshire, was employed. At Drumclog, on Sunday, 1st June 1679, he encountered an armed body of Covenanters, but was defeated, some forty of his troopers being slain, and himself forced to flee from the field. Three weeks later, at Bothwell Brig, he served as a simple captain of cavalry. These are the only affairs that can even by courtesy be called battles in which Claverhouse was engaged in Scotland previous to James II.'s abdication. They displayed no generalship. In detecting and hunting down the Covenanters he evinced the utmost activity; still, he had nothing whatever to do with the Wigtown martyrdoms, and if he caused shoot John Brown, the 'Christian Carrier,' it was after finding of arms and refusal to take the oath of abjuration. He rose to the rank of colonel, and in 1682 became sheriff of Wigtownshire, in 1683 was sworn a privy-councillor, in 1684 got a gift of the Forfarshire estate of Dudhope, and was made constable of Dundee. That same year he married Lady Jean Cochrane, the daughter of a Whig house, who bore him one short-lived son, and who afterwards wedded the Viscount of Kilsyth. In November 1688, on his march up to London to stem the Revolution, Claverhouse was raised to the peerage as Viscount Dundee; four months later he rode with fifty troopers out of Edinburgh, and, being joined by the Jacobite clans and three hundred Irish, raised the standard for King James against William and Mary. After various rapid movements in the north, he seized Blair Castle, the key of the Highlands; and General Mackay, commanding the government forces, marched against him from Edinburgh. On the evening of 27th July 1689 the two armies met at the head of the Pass of Killiecrankie. Mackay's force was between 3000 and 4000; Dundee's only 2000. Two minutes decided the contest; before the wild rush of the clansmen the redcoats wavered, broke, and ran like sheep. Their loss was 2000, the victors' 900 only; but one of the 900 was Ian Dhu nan Cath (or 'Black John of the Battles'), as the Highlanders called Dundee. A musket-ball struck him as he was waving on his men, and he sank from his saddle into the arms of a soldier named Johnstone. 'How goes the day?' murmured Dundee. 'Well for King James,' said Johnstone, 'but I am sorry for your lordship.' 'If it is well for him,' was the dying man's answer, 'it matters the less for me.' Wrapped in two plaids, his body was borne to Blair Castle; and in the church of Old Blair they buried him, where in 1889 the Duke of Athole placed a tablet to his memory.

'Bloody Claverse,' 'Bonnie Dundee'—the two names illustrate the opposite feelings borne towards one whom the malice of foes and the favour of friends have invested with a factitious interest. He was neither the devil incarnate that legend and Lord Macaulay have painted him, nor the 17th-century Havelock of Aytoun, Napier, and Paget. True, Wodrow himself admits that 'the Hell-wicked-witted, bloodthirsty Graham of Claverhouse hated to spend his time with wine and women;' Lochiel's biographer records how he never was heard to swear, and how, 'besides family worship, performed regularly evening and morning in his house, he retired to his closet at certain hours, and employed himself in that duty.' But, then, we have Claverhouse's own admission (1679): 'In any service I have been in I never inquired farther in the laws than the orders of my superior officers'—an admission that accuses whilst excusing, and that is applicable to his whole career. Bonnie at least he was in outward form, with the 'long dark curled locks,' and the 'melancholy haughty countenance,' which we know by his portraits and by Scott's matchless description.

The letter purporting to be written to James II. by Dundee after he had got his death wound, and first published in Macpherson's *Original Papers* (1775), is almost certainly a forgery, though not Macpherson's. The *Grameid* is a long but unfinished Latin epic by James Philip of Almerieclose (*c.* 1656–1713), one of Dundee's followers. Written in 1691, it was first edited by the Rev. A. D. Murdoch for the Scottish History Society (1888). Mark Napier's *Memorials and Letters of Dundee* (3 vols. 1859–62) is perhaps the worst life in the language, still well worth sifting. See also Aytoun's *Lays of the Scottish Cavaliers* (1849); Paget's *Paradoxes and Puzzles* (1874); *Claverhouse*, by Mowbray Morris ('English Worthies' series, 1887); and *Clavers, the Despot's Champion*, by 'a Southern' (1889).

Graham, THOMAS, a Scottish chemist, was born in Glasgow, 21st December 1805. Having studied at Glasgow and Edinburgh, he became in 1830 professor of Chemistry in his native city, and in 1837 he accepted the corresponding chair at University College, London. In 1855 he was appointed Master of the Mint, and resigned his professorship. He died in London, 16th September 1869. His name is most closely associated with the subject of the molecular diffusion of gases, his researches in connection with which led him to formulate the law 'that the diffusion rate of gases is inversely as the square root of their density.' Amongst his important memoirs on chemistry we may mention the following: 'Absorption of Gases by Liquids;' 'Absorption of Vapours by Liquids;' 'Law of Diffusion of Gases;' 'Researches on the Arseniates, Phosphates, and Modifications of Phosphoric Acid;' 'Motion of Gases, their Effusion and Transpiration;' 'Diffusion of Liquids;' 'Liquid Diffusion applied to Analysis;' 'Liquid Transpiration in Relation to Chemical Composition;' and 'Molecular Mobility of Gases.' These were contributed to various scientific journals, and were collected in 1876. His excellent *Elements of Chemistry* appeared in 1837. See *Life and Works of Graham*, by Dr R. Angus Smith (Glasgow, 1884).

Graham, THOMAS. See LYNEDOCH (LORD).

Grahame, JAMES, author of *The Sabbath*, was born at Glasgow, April 22, 1765. The son of a prosperous lawyer, he went in 1784 to Edinburgh to study law, and, after qualifying as a writer to the Signet, was admitted as an advocate in 1795. Finding law uncongenial, at forty-four he took orders, and was successively curate of Shipton in Gloucestershire and of Sedgefield in the county of Durham. Ill-health compelled him to return to Scotland, where soon after he died, September 14, 1811. Grahame's poetical works include *Mary, Queen of Scots*, a dramatic poem (1801); *The Sabbath* (1804); *British Georgics* (1804); *The Birds of Scotland* (1806); and *Poems on the Abolition of the Slave-trade* (1810). His fame rests securely on his

blank verse poem, *The Sabbath*. It falls far short of Cowper's vigour, variety, and real genius, but in its tender devotional feeling and occasional felicity in describing quiet Scottish scenery it is not unworthy of that master, whom he resembled further in the retiring amiability of his character.

Graham's Land, an island of the Antarctic Ocean, discovered by Biscoe in 1832, lies between 65° and 67° S. lat. In front, towards the north, are a number of islets, called Biscoe's Chain.

Grahamstown, the capital of the eastern province of Cape Colony, stands near the centre of the maritime division of Albany, 1728 feet above sea-level. By rail it is 106 miles NE. of Port Elizabeth, and 43 NW. of Port Alfred. It is the seat of two bishops—Anglican and Roman Catholic; and in its Anglican cathedral is a monument to Colonel Graham, after whom the city is named. Leather is manufactured, and among the institutions of the place are its museum, St Andrew's College, a public library, a general hospital, and large barracks. Pop. (1875) 6903; (1891) 16,498, of whom about 7000 are whites.

Grahamstown, New Zealand. See THAMES.

Graian Alps. See ALPS.

Grail, LEGEND OF THE HOLY (etymology uncertain). The spelling varies considerably in the oldest texts from *graal* to *greaus*. A vessel of some kind is obviously intended, and derivation has been suggested from the Low Lat. *gradalis* or *gradalus* ('a shallow vessel'), which appears also in the forms *grasale*, *grassale*, *grazala*, and Old Fr. *grasals* or *grazals*. See Ducange-Favre, *Gloss. Med. et Inf. Lat.*, under 'Grasala.' This etymology is supported by the testimony of Helinandus (*c.* 1204), 'gradalis dicitur gallice scutella lata et aliquantulum profunda, in qua dapes solent apponi, et dicitur nomine graal.' Diez, *Etymol. Wörterbuch*, 601, suggests a lost *cratalis* from *cratus*, the Low Latin form of *crater*, as the original of the above-cited forms. Other etymologies have been suggested, but all are worthless.

Chronological Arrangement of the Grail Romances.—(*a*) Chrestien's portion of the Conte du Graal, *circa* 1190; (*b*) Gautier de Doulens' continuation of same, *circa* 1195 in one form, with expansions *circa* 1200; (*c*) Robert de Borron's poem, 1200–10; (*d*) Queste del Saint Graal, about the same date; (*e*) Grand St Graal, only known in a redaction of *circa* 1230–50, but extant in a less extended form prior to 1204; (*f*) Wolfram von Eschenbach's Parzival, *circa* 1210; (*g*, *h*) continuation of Conte du Graal by Manessier and Gerbert, *circa* 1220–30; (*i*) the prose Perceval le Gallois, *circa* 1225; (*k*) prose continuation of Robert de Borron's poem known as the Didot Perceval, *circa* 1230–50; (*l*) Heinrich von dem Türlin's Diu Krone, prior to 1250. Personages and part of the subject-matter of the Grail romances also appear in (*m*) the Mabinogi of Peredur ab Evraw and (*n*) the alliterative metrical romance Sir Perceval. Both these last are in 14th–15th century MSS., but are certainly older, though posterior in their present form to Chrestien, whom both have used.

Subject-matter of the Romances. The legend consists of two portions: a Quest relating (1) how Perceval comes to the castle of the Fisher King, sees the Grail, fails to ask concerning it, is reproved, has to wander many years, comes a second and third time to Grail Castle, makes whole a broken sword or slays the enemy of the Fisher King, is hailed by the latter as his nephew, and succeeds him in his kingship (*a*, *b*, *f*, *g*, *h*), or releases him at once from supernaturally prolonged life (*k*) or from the enchantment of death in life (*l*) (the same incidents as in *a*, *f*, *g*, *h* reappear in part in *m*, but the Grail is replaced by a head in a dish); (2) how Galahad, Perceval, and Bors alone of Arthur's knights succeed in beholding the Grail, follow it to the east, where Galahad and Perceval die, but Bors returns to Arthur's court (*d*, *e*)—and an Early History relating how the Grail was given by Christ to Joseph of Arimathea (*c*, *d*, *e*, *g*, *h*, *k*), and how it came to England either in the charge of Brons, Joseph's brother-in-law (*c*, *k*), or of Josephe, Joseph's son (*d*, *e*). In all these versions the Grail is a cup or vessel, and in the Early History forms it is the cup used first by Christ at the Last Supper, secondly by Joseph to collect the blood which flowed from Christ's wounds as he hung upon, or after his body was descended from, the cross. In (*f*) Wolfram an entirely different account is found: the Grail is a precious stone, fallen from heaven, and given in charge to Titurel and his dynasty the Grail kings.

Nature and Properties of the Grail.—In the Quest romances, the oldest portion of the cycle, and notably in the Conte du Graal, the Grail is simply a miraculous food-producing vessel. With a broken sword which only the destined hero can make whole, and a lance which drops blood, it is simply one of three talismans, and its importance in the conduct of the story is not greater than theirs. The Christianisation of the legend brought about a profound change in the conception of the Grail. This change is only fully manifest in Robert de Borron, where the properties of the Grail are exclusively spiritual: it separates the pure from the impure, and gives to the former as full and sweet solace as their heart could long for. In the other Early History forms, and in those later Quest versions which have been affected by the Early History, the Grail retains its material side by side with its spiritual properties, even where, as in the case of *d*, *e*, and *h*, these versions are written in a mystical and theological spirit. From (*d*) Queste we learn that the Grail strikes with dumbness those to whom it appears. In Wolfram (*f*) the spirit is likewise mystical and theological, but of course the sacramental nature of the Grail, so prominent in those romances which identify it with the Last Supper cup, is wanting, hence the symbolism is on different lines. Here too, however, the material properties of the Grail are as strongly insisted upon as the spiritual ones.

Hypothetical Development of the Legend.—The Grail is originally a portion of the gear of old Celtic divinities, more especially of the god of the underworld, whose name among the Cymry was Bran. Numerous Celtic sagas, as well as existing Celtic folk-tales, tell of a hero who journeys to the land of shades and brings back talismans, prominent amongst them the inexhaustible vessel of plenty and rejuvenation. At an early period this tale got mixed up with a Peredur saga, in which the hero, to avenge a kinsman, had to seek for a magic lance and sword. The result of the fusion may be traced in the forms which underlie the Mabinogi of Peredur, the Conte du Graal, and the metrical Sir Perceval. Peredur thus came in contact with Bran, lord of the under-world, who was identified with Bran the Blessed, whom later Welsh tradition made the hero of a conversion of Britain story. This Bran is the Brons of the Joseph of Arimathea legend, and by this means the old Celtic heathen vessel of increase and youth came into connection with the follower of Christ, who was at an early date a favourite legendary figure on British soil, the Evangelium Nicodemi which relates his legend having been widely known there at a time when continental literature is altogether silent regarding it. The Christianisation of the Celtic saga had probably begun before Chrestien, though only to a very slight extent. It was fully carried out by men who wrote after, and in

opposition to him, and who wished to make the story a vehicle for moral and religious teaching. Robert de Borron alone worked out the conception in a fairly consistent way; in the other theological romance-writers—e.g. the authors of the Queste, of the Grand St Graal, and Gerbert—the Graal is at least as much heathen as Christian. In these romances the tendency is rather moral than dogmatic: they are in the main glorifications of asceticism, and in especial of physical chastity. This latter idea, almost foreign to the earlier works of the cycle, is most fully worked out in the Queste, a new hero, Galahad, being especially created to typify the virtue of virginity. The Queste was one of the romances used by Malory in his Morte Darthur; hence the Galahad story has had a great and abiding influence upon English literature through Tennyson and others. Wolfram von Eschenbach, like Robert de Borron and the author of the Queste, received the story from Chrestien, and, like them, was dissatisfied with the latter's treatment of it. He, however, has worked out a religious and ethical ideal of a far nobler and truer kind than that found in the Queste. His conception is based, not upon chastity, but upon charity, and the Grail becomes with him a symbol, not of ascetic longing and its unearthly reward, but of human striving and human love in their noblest manifestation.

Evidence in support of the foregoing contentions, together with full summaries of the romances themselves, and bibliography and analysis of the investigations of previous students, will be found in the writer's *Studies on the Legend of the Holy Grail, with especial Reference to the Hypothesis of its Celtic Origin* (1888). Compare also M. Gaston Paris's *Histoire Littéraire de la France*, vol. XXX. (1888); and for alleged Buddhist influence upon the Grail legend, the writer's article in the *Archæological Review*, June 1889. See also ROMANCES, MAP (WALTER), TENNYSON.

Graile. See GRADUAL.

Grain. For grain imports and exports, see FOOD, Vol. IV. p. 720; also the articles WHEAT, &c.

Grain, as a unit of weight, is supposed to be the average weight of a seed or well-ripened ear of wheat; of such grains 7000 are held to be a pound avoirdupois. The grain is also the 20th part of a scruple in apothecaries' weight, and the 24th part of a pennyweight troy. See also GRAMME.

Grain Coast. See GUINEA.

Graining, a kind of dace found in the Mersey and some few English rivers, and in Swiss lakes, distinguished by Pennant and Yarrell as a separate species (*Leuciscus lancastriensis*), but regarded by Günther as only a local variety of the dace (*L. vulgaris*). See DACE.

Grains of Paradise, or MALEGUETTA PEPPER, an aromatic and extremely hot and pungent seed imported from Guinea. It is the produce of *Amomum Grana Paradisi*, a plant of the order Zingiberaceæ. By the natives these seeds are used as a spice or condiment; in Europe chiefly in veterinary practice, and fraudulently to increase the pungency of fermented and spirituous liquors. By 56 Geo. III. chap. 58, brewers and dealers in beer in England were prohibited, under a heavy penalty, from even having grains of paradise in their possession. This drug is much used to give apparent strength to bad gin. The name Maleguetta Pepper, or Guinea Pepper (q.v.), is also given to other pungent seeds from the west of Africa.

Grakle, the common name of many birds of the Starling family (Sturnidæ), all tropical or subtropical. They have very much the habits of starlings, which some of them even excel in their imitative powers, and particularly in the imitation of human speech. This is remarkably the case with the Mina Birds or Hills Mynas (*Gracula javana*), common in India, which are easily tamed and taught. Many grakles feed on seeds and fruits, while others are useful as destroyers of insects. See STARLING.—In the United States the name Grakle or Grackle is applied to several species of the genera Scolecophagus and Quiscalus, omnivorous birds, also called 'blackbirds' and 'boat-tails.'

Grallæ, or GRALLATORES (Lat., 'stilt-walkers'), an old order of wading and running birds, including rails (Rallidæ), snipes and curlews (Scolopacidæ), plovers (Charadriidæ), bustards (Otididæ), cranes (Gruidæ), herons and bitterns (Ardeidæ), storks (Ciconiidæ), and numerous other families. These are grouped by modern ornithologists in a number of smaller orders, while the old order Grallæ is abandoned as too hopelessly large. They are mostly long-legged marsh or coast birds, generally with long legs and bills. Their distribution is very wide, the four largest families (rails, snipes, plovers, and herons) being quite cosmopolitan.

Gram. See CHICK PEA.

Gramineæ. See GRASSES.

Grammar deals with the usage of some one form of speech. It may be described as a section of the larger science of language (see article PHILOLOGY), which treats of the origin, development, and general character of the principal families of language and of human speech as a whole. In common use, however, grammar means not a branch of science, but a treatise on some one well-defined form of speech as used in the present day, as by French grammar we mean a book on the usage of Paris; by English grammar we mean an account of the language spoken and written by educated men throughout Great Britain, which language, however, is only one dialect of English speech, the East Midland. That dialect by favouring conditions has superseded the other dialects, southern and northern, which were once spoken and written, and are still in a lessening degree spoken, in different parts of the island.

Grammar has two parts. The first describes the forms of a language, the single words which occur in it, its nouns, verbs, &c.; and its modifications of such forms, the cases of its nouns, the persons and tenses of its verbs, &c., used to express modifications of the same idea, as 'child,' 'child's,' 'children,' 'spring,' 'sprang,' 'sprung,' in English. This is called the morphology of a language, or (more loosely) its etymology. The second part deals with the use of these forms in combination: their syntax—i.e. their arrangement in order of speech. The general principles of this will vary little in the different languages of the same family; but each language has its idioms, as we call them, its own special refinements of usage, and it is in the clear discrimination of these that the practical value of a grammar lies.

Grammar in this function may be called special. It does not enter into the history of the forms which it describes; it is sufficient if it sets forth what they are at a particular time, without showing how they became such. But it is possible to a considerable extent to trace the history of these forms—e.g. we can see how literary English has developed out of the English of Chaucer, and that from the English of an earlier day, how the forms have changed mostly in the direction of uniformity, and how (to a lesser degree) their syntax has altered. To trace this belongs to historical grammar, and some of the results of this science are now commonly given in

each special grammar. Lastly we can compare together the forms and usage of cognate dialects. We can compare, e.g., the grammar of our literary English dialect and that of the speech of Dorset, as set forth by Mr Barnes; and, employing the results of historical grammar, we can trace back the varying development of English speech as a whole; or we can compare the development and trace the connection of English and of German speech, and the relation of each of these to Latin or to Greek, till we arrive at some knowledge of a common speech of which all these are only derived forms. This is the work of comparative grammar.

Naturally, we do not learn our own speech from a written grammar. A child learns his words and their use from those around him, not as a whole, but one by one; and he forms new words for himself on the analogy of those he has already acquired. When he finds that any of these formations are not used by others he rejects them, and so he assimilates his speech to that of those around him. It is when we have to deal with a speech which is not our own, either that of a foreign nation, or of our own language at some earlier period, or of some dialect of our own language, that we need a grammar. The earliest works on grammar were due to the second of these causes. At Alexandria, the great commercial and literary centre of Greece in the days when the separate Greek states had ceased to be autonomous, there was for the first time a huge collection of the works of earlier writers, especially the Homeric poems. The age was one destitute of original ability; the loss of freedom had caused the loss of the motives which had produced the literature of the past. But it contained a large number of literary men, whose activity was chiefly spent on the work of their predecessors. This was to them in language and in style archaic; it required glosses—as we should say, glossaries—and explanations of disused forms. Hence arose the first grammarians, men often of conspicuous ability in their own line, such as Zenodotus and Aristarchus. At a later time, Romans who wished to learn Greek had grammars based upon Greek models, compiled for them in Latin, and these have been the parents of all European grammars to the present day. The grammatical terms with which we are familiar are consequently in the main Latin translations of Greek originals, and because of this they are often less intelligible than they might be.

It is to the Greeks that we owe the number of the so-called 'parts of speech.' But their eight were not the same as ours. They had (1) the noun; (2) the verb (terms which go back to Aristotle, though in his use the 'verb' meant all that is logically called the predicate); (3) the participle, so called because it partook of the nature of both the noun and the verb—it was a noun in form, yet it governed a case like a verb; (4) the article; (5) the pronoun; (6) the preposition, so called not as being placed before a case, but as set before a verb or noun in composition; (7) the adverb—i.e. the 'additional predication,' not anything specially belonging to the verb, as the Latin name seems to imply; (8) the conjunction. The Romans modified this list. First, they rejected the participle, and supplied its place by dividing the noun into the substantive and the adjective; this is a gain to logic, but as a matter of history the two go back to the same origin. The thing and the quality of the thing were alike expressed by the noun, and the analogic feeling in man suggested that they should be represented when together by nouns of the same class—i.e. with the same terminations: hence we have the grammatical property called gender, which is altogether independent of natural gender. Secondly, they rejected the article in their grammar, not having it in their speech. Here they were historically right, for the Greek article was only a pronoun. Later Latin developed a new one out of a different pronoun, *ille*, seen in various forms in the different Romance languages—French, Italian, Spanish, &c. But having lost the article they felt bound to fill up its place: therefore they put in the interjection, which is the conventional stereotyped expression of the natural cries which, we may believe, in days before articulate speech existed, eked out the earliest and simplest means of communication—i.e. gestures (see article PHILOLOGY). The interjection is therefore no 'part of speech;' it is an imperfect undeveloped 'speech whole;' and the Greeks rightly did not include it in their list.

If we exclude the interjection, we can prove by means of historical grammar that these different parts of speech run back to two, the noun and the verb; and the distinction even of these rests on the inability of our analysis to separate them completely. It is true that nouns are distinguished by 'case-suffixes'—*lupus*, *lupum*, *lupi*, *lupo*, &c. in Latin; and the verb by 'personal suffixes'—*amo*, *amas*, *amat*, &c.; but there was doubtless a time in our parent-speech when no such 'suffixes' existed, and all that lies behind them may have been in those earlier days identical for noun and verb. Our own language shows the possibility of using one form—e.g. 'love,' alike for noun and verb. The pronoun differs from the noun in meaning by its greater generality. 'This' includes all objects in our immediate neighbourhood, books, chairs, tables, &c.; 'he' includes all 'Johns,' 'Smiths,' &c. In form it differs only by the simpler and on the whole the more archaic character of its root or ultimate element. The term 'pronoun' expresses only one subordinate use—the anaphoric or 'reference' use, by virtue of which, having once uttered a man's differentiating name, 'John,' or the like, we refer to him afterwards, so long as clearness permits, only as 'he.' The origin of adverbs and prepositions out of nouns or pronouns is very obvious in our own language: 'once' is Old Eng. *ānes*, the genitive of *ān* ('one'); 'seldom' is an old dative plural of *seld* ('rare'); to go 'afoot' was to go 'on' foot; 'beside' is 'by side (of);' and, if we are unable to reach the original form of prepositions like 'on' and 'by,' we do not doubt that in days beyond our analysis they were nouns modifying other words which then filled the place of the nouns and verbs of later times. Similarly, conjunctions are either noun-cases or condensed sentences; 'whil-s-t' is 'whiles,' the genitive of 'while' (time), with a final *t*, which may be analogous to that of 'lest' (another conjunction), originally 'thī less the,' then 'lesthe,' and 'leste;' 'howbeit,' 'because' (by cause of) explain themselves. Thus the eight parts of speech may be traced back to not more than two.

All language at all times of which we have any knowledge, and doubtless from the very beginning of human speech, is a modification of existing combinations of sound. Language probably began, as has been already suggested, with the use of cries to help out gestures. These cries were associated by use with particular ideas, and that most elementary language (or languages, for there is no need to suppose that language sprang up in one place only, the circumstances being everywhere similar) was subject to the same laws which mould our speech at the present day. Groups of sound expressing the required thought are combined together, as 'man' and 'kind,' or 'house' and 'top.' The combination may be such that the different parts are always separable; then each

sound-group (or word, as we may now call it) remains intact, and the relation which one word bears to another in the expression of the entire thought depends on the position of the words, the stress, or the pitch of the voice with which each is pronounced, or other more minute conditions. A language of which this is the prevailing character is called 'isolating,' and Chinese is the best-known type. It seems inadequate, yet the facility with which ideas can be expressed in such a language may be seen from the different grammatical values which the same sound-group can have in our own language in phrases like 'love is sweet,' 'we feel love,' 'God is love,' 'I love you,' &c.

But nearly all languages admit of combination more complete than this, whereby two or more words can be joined together, so that a single sound-complex expresses two or more ideas in combination—e.g. 'free-man,' 'black-bird,' 'thank-ful,' 'high-born,' 'back-bite,' 'ill-treat,' &c. Each of these may form the model for numerous copies; thus, 'thankful' can produce 'youthful,' 'healthful,' which are later English compounds. Then came hybrid compounds, where the first member is of Latin origin (of course through the Norman), as 'merciful,' 'masterful.' In this last we see that the exact nature of the original compound is obscured, and that 'ful' gives merely the additional sense of 'like,' as though the compound had been 'masterlike,' which does indeed occur in a briefer form, and with a secondary sense, as 'masterly.' This example throws light on the history of all word-formation. A word may cease to be felt as a compound commonly through change of form in one or both of its parts, as 'masterly,' where the idea of the skill of a master in some art alone remains; or 'hussy' (house-wife), where both parts of the compound are lost. Sometimes only one syllable may remain, as in 'lord' (loaf-ward). Often some great change of idea joins with phonetic change in obscuring the nature of a compound, as in fortnight (fourteen-night). Now, when the last part of the compound fulfils certain conditions, it may be used in the formation of countless other words: *-lic* (like), which is found in O. E. in 'eorth-lic,' 'cyne-lic' (earthly, kingly), passes on in its simpler form *-ly* in 'daily,' 'princely,' &c.; and *-ly* is then what grammarians call a suffix, an element which cannot be used alone, but can be added on at pleasure to another word to modify its meaning. The conditions are (1) that the form of the so-called suffix must be a convenient one phonetically; (2) that it must have been in use in a considerable number of compounds at the same time: for 'bridegroom' (bride-man), 'nightingale' (*nihte-gale*, night-singer), 'gossip' (*God-sib*, God-related) have produced no analogous forms in English owing to the rarity of the use of their second member; (3) that the last member must be general in its sense, or at least acquire some general sense in composition. A suffix is especially favoured which can be mentally referred to some common word of general sense, though it may really have nothing to do with that word. Thus, in 'credible,' 'invincible,' &c. the original suffix *-ble* (*-bili* in Latin) is seen; but in many words which come to us through the French, 'probable,' 'amiable,' *a* preceded the last syllable: thus these words seemed to mean 'able' to be proved, or to be loved; and so words like 'knowable,' 'lovable,' 'reliable' sprang up in abundance. Independently of these conditions of the origin of suffixes, it is also necessary that the first member of a compound remain unobscured. Thus, no words have been formed on the model of 'orchard' (*wort-yard*), though *-ard* as a Norman-French suffix has produced derivatives like 'drunkard,' on the analogy of 'bastard,' 'wizard.'

We are justified in inferring from the English suffixes which can be explained as remnants of words (*-ful*, *-ly*, *-dom*, *-hood*, and the like) that the others whose history can no longer be traced had a similar origin; and even in extending this principle to those formative suffixes which reach back to the earliest period of language. It is a sound axiom that what is in language has been and will be; it is only by dealing with spoken languages that we can infer the nature of those known to us by tradition only. It cannot be said with certainty that we should assign the same origin to those other suffixes—which we call inflectional—to which we owe the cases of our nouns, and the persons, tenses, and voices of our verbs. The persons, indeed, of the verbs were, it is most probable, pronouns. The *m* in 'am' represents original 'I,' so 'am' meant 'exist I,' and was a compound of two words, originally as separate as 'I exist;' *s* represented 'thou,' and *t* (Eng. *th* in 'loveth,' &c.) was 'he.' But we cannot say exactly what the tense-suffixes were, though we believe they are the remnants of words; nor what were the case-suffixes of the nouns—what, for example, was the *s* which still marks our genitive case, or the *s* of our plurals. But we know that we can make a 'noun of multitude' by making such a compound as 'man-kind,' and there is no reason why *-es* (the original form of *-s*, our plural suffix) may not once have been some such word as 'kind,' and compounded in the same manner. Such a history is in accordance with all we know of the processes of language.

It will be apparent from what has been said that there never was in any language some one period in which its suffixes were made, succeeded by a period in which there was no more growth but only decay. Formation is always going on, though more slowly in languages which are stereotyped by literature. In English we have almost ceased to use our second personal suffix *-st*, in 'lovest,' &c. But that *st* is itself an English growth: the older English form was *s:* in the old Mercian Psalter (edited by Mr Sweet in his *Oldest English Texts*) we find both 'thu dydes' and 'thu dydest,' 'thu bis' and 'thu bist,' &c. Other Teutonic languages show the same (independent) development. Still more do 'formative suffixes' go on growing. One of our commoner English suffixes (used to make a diminutive) is *-let*, seen in comparatively recent words, like 'brooklet,' 'streamlet,' &c. But the form is really a development of the older *-et* (the French *-ette*) in 'helmet,' 'banneret,' 'cygnet.' Several of these forms, like 'islet,' 'circlet,' and 'eaglet,' were formed out of nouns which ended in *l;* and so new ones were formed—'ring-let,' &c., as though the *l* had always belonged to the suffix. We are getting a new suffix in *-nist*, seen in 'tobacco-nist,' &c. This is an extension of the old suffix (Greek, through Latin into French) *-ist*, in 'jurist,' 'dentist,' &c.; this seems to be due to words where the *n* belongs to the root-part, as 'mechan-ist,' 'pian-ist,' and other late forms.

A common method of inflection in language is, not by suffix, but by change of the original vowel: thus, we have 'man,' but plural 'men;' and in verbs we find present 'drink,' preterite 'drank,' past participle 'drunken.' These can, however, be traced to the influence in different ways of lost suffixes. Thus, the old declension of 'man' was nom. 'mann;' gen. 'mannes;' dat. 'menn(i);' plur. nom. 'menn(i);' gen. 'manna;' dat. 'mannum.' It is clear that the change of *a* to *e* had at first nothing to do with the plural, for it is found in singular and plural alike when *i* followed: this vowel had the property of modifying *a* in a preceding syllable to *e*. But when the cases were lost, as happened in English mainly through Norman

influence, 'man' remained as the only singular form, and 'men' as the only plural; so, for grammatical purposes, the plural might truly be said to be made by changing *a* to *e*. Similar is the history of 'mouse,' plur. 'mice;' 'goose,' plur. 'geese,' &c. The verb change, *i*, *a*, *u*, has a most symmetrical look, and seems as though it must have been devised to express the change of relation. As a fact, however, in this and all similar cases, *i* and *u* represent in all Germanic languages original *e* and *o*; and these two vowels probably represent developments of a minute variation in pitch-accent (*e* being higher than *o*), dating from beyond the historic period of the parent-speech; and this variation marks indeed tense distinctions—e.g. in Greek, pres. *dérkomai*, perf. *dédorka*; but it is also found in nouns such as *génos*, *gónos*, and it seems to have had nothing to do with tenses at first. The second change, that in 'drank,' 'drunken,' has quite a different origin, but one equally removed from tense-formation. Like the first variation, it represents a very ancient change—due to the fact that in the parent language the syllables immediately preceding or following that which bore the stress-accent were weakened: no language shows better than English how to slur a syllable immediately preceding or following a stressed one—e.g. in 'alone' (where the last syllable is stressed) the *a*, originally the full *a* of 'all,' is sounded like the *u* of 'but,' or the *o* of 'son;' the same sound is commonly heard—e.g. in such a word as 'liberty,' instead of the *e* of the middle syllable, the stress being on the first. Now in the past participle the stress was on the suffix *-no* (seen as *-en* in 'drunken'), and hence the vowel-change in the root. But it oddly happens that just the same change took place in the plural of the perfect itself, owing to the plural personal suffixes being stressed in the parent language; and so the Old English singular third person was 'drank,' but the third plural was 'druncon' (a precisely parallel case is the Greek sing. *oida*, plur. *idmen*, orig. *idmen*). So there was a time when it was right to say 'I drank' and 'we drunk;' but a meaningless distinction like this could not be maintained: one form was bound to supplant the other, and 'drank' won; but 'won,' the plur. of 'winnan,' supplanted the sing. 'wann;' 'stung' beat 'stang;' 'sprang' and 'sprung' were used indifferently at the beginning of this century, as by Scott and Byron, to help their rhymes; and here and in other verbs there is still some fluctuation of use, even among educated men. These examples may suffice to show that vowel-change, though extremely useful to mark grammatical distinctions, was not in anyway designed for this end, which has been reached by unconscious differentiation: for we may infer from what we can observe in languages whose history can be traced that the prehistoric distinctions in the earliest recorded languages had a like accidental origin.

The history of grammatical forms may then be roughly sketched thus. They arose probably always from composition. Such compounds were subject to phonetic corruption, and the unstressed syllables were slurred and lost their individuality; or one member of the compound ceased to be used independently, some other word having superseded it, the result being the same as in the first case—viz. the loss of special significance in one part of the compound; and when the part so generalised is the final syllable, that syllable becomes a mere suffix, and can express relation, as the *-ly* in 'fatherly,' or the *-s* in 'fathers.' Furthermore, the cases of the nouns and the persons of the verbs thus formed were liable to variations of form in the same noun or verb, due to the incidence of stress or the influence of one syllable on another. The irregularities thus produced were again levelled in process of time by the natural tendency to do away with differences which are no longer significant; hence came symmetry of inflection, which is not the earliest stage in grammar, but rather the result of long unconscious play of physical and mental forces. Again, inflections constantly perished, either by simple phonetic decay, or more commonly through change of nationality, as, for example, when the Teutonic and other races adopted the Latin of the conquered Roman provinces, or when the descendants of the Normans began to use the national speech of England. Thus arises much simplification of what is to the speakers a foreign grammar; also there is a great growth of hybrid forms, Norman-French words combining with English suffixes, and *vice versâ*. With the dying out of inflections arises a great growth of indeclinable words—adverbs, conjunctions, and prepositions: some cases, as the locative or the ablative in Greek, or the instrumental in Latin, became almost extinct; the few surviving forms, as Greek locatives in *-ei* and ablatives in *-os*, belonging to nouns of the *o* class, lost their connection with those nouns; they remained isolated forms, freed from the levelling tendencies which affected the other cases of the same noun, because no longer felt to be in connection with them. Thus they could become the origin each of a new group of forms, extending (as did the so-called Greek adverbs in *-ei* and *-ōs*) to many other classes of nouns besides that which gave them birth. Very commonly this isolation of some particular form may arise while the case is still in full use, through some accidental break of connection. In English our one surviving case-form in the genitive is *-s*, yet this very form has been the parent of numerous adverbs: 'ānes' (already mentioned) was the genitive of 'ān' (one): the connection was lost, and the adverb 'once' arose, and produced 'twice' (older form 'twi-es'), 'thrice' by mere analogy, no such genitives having ever existed; so, too, 'forward-s,' 'alway-s,' and many others are analogical forms—no true genitives, but copies of the model set by an isolated genitive. It has been well said by one of the greatest of modern German philologists, Professor H. Paul, that isolation is the essential condition of all speech-development.

Lastly, even while cases survive in use, it is necessary to supplement them by prepositions, because (except perhaps in languages which, like the Finnish, have fifteen cases) there are not enough case-forms to express the numerous relations in space ('to,' 'from,' 'in,' 'upon,' 'by,' 'near,' 'with,' &c.) in which one person or thing may stand to another. As cases die out this need increases, and modern European languages express practically all relations by prepositions. This principle is sometimes called analysis, as contrasted with the combinatory 'synthetic' principle of older forms of languages. Naturally no language is ever completely analytic: even in English words like 'father's' and 'love's' still attest that the language was once synthetic.

Those who desire fuller insight into the principles of grammar (as seen in languages of the Indo-European type) may consult the well known works of Prof. Max Müller; A. H. Sayce's *Principles of Comparative Philology*, and his *Introduction to the Science of Language*, which treat the subject from a different standpoint; W. D. Whitney's *Life and Growth of Language*, and his *Linguistic Studies*; H. Paul's *Principien der Sprachgeschichte*, an invaluable but difficult work, translated, though not made materially easier, by Prof. Strong. A synoptic view of the relation of the Indo-European languages will be found in the still unfinished *Grundriss der vergleichenden Grammatik* of Karl Brugmann (vol. i.

trans. by Wright). Excellent works on special languages are Whitney's Sanskrit Grammar and Delbruck's *Altindische Syntax*; for Greek, may be mentioned (out of many) Brugmann's Grammar in J. Müller's *Handbuch der klassischen Altertumswissenschaft*, and D. B. Monro's *Homeric Grammar*—a most suggestive book; for Latin, Stolz's Grammar (also in Müller's *Handbuch*), and Dräger's *Historical Latin Syntax*, which, though old, is still the most systematic work on the subject; innumerable valuable articles bearing on both Greek and Latin are to be found in Kuhn's *Zeitschrift*, Bezzenberger's *Beiträge*, the *Mémoires de la Société de Linguistique*, the Cambridge and the American Journals of Philology; for Keltic, the Grammars of Zeuss and Windisch (Old Irish, trans. by Dr N. Moore), and Prof. Rhys's Lectures on Welsh Philology; for the Romance languages collectively, the Grammar of Diez and the (still unfinished) *Grundriss der romanischen Philologie* of G. Grober; special works on these languages are too numerous to mention. For Teutonic languages there is an excellent series of grammars published by Niemeyer (Halle), on Icelandic by Noreen, on Old High German by Braune, and on Middle High German by Paul (Strong and K. Meyer's *History of the German Language* may also be found useful); on Gothic, Braune; see also Douse's *Ulfilas*, and Prof. Skeat's little edition of the Gospel of St Mark in Gothic. For English, Sweet's *Anglo-Saxon Reader* and Cook's trans. of Sievers' Grammar of Old English are the best; Prof. Skeat's *Principles of English Etymology* should also be consulted; Storm's *Englische Philologie* is excellent, but still a fragment; A. J. Ellis' *Early English Pronunciation* (5 vols. 1869 89) is a mine of information on the history of the English language.

Grammar-schools. See EDUCATION.

Gramme is the standard unit of French measures of weight, and is the weight of a cubic centimètre of distilled water at 0° Centigrade (corresponding to 32° F.); the other weights have received names corresponding to the number of grammes they contain, or the number of times they are contained in a gramme (see DECIMAL SYSTEM, METRIC SYSTEM). A gramme = 15·43248 grains troy, from which the equivalents in English measure for the other weights can easily be found; thus:

	Grains Troy.		Lbs. Avoirdupois.	
Centigramme =	·1543234	=	·0000220462	
Decigramme =	1·543234	=	·000220462	
GRAMME =	15·43234	=	·0022046	
Decagramme =	154·3234	=	·022046	
Hectogramme =	1543·234	=	·220462	
Kilogramme =	15432·34	=	2·20462	
Myriagramme =	154323·4	=	22·0462	= ·19684 cwt.
Quintal (q.v.) =	1543234	=	220·462	= 1 9684 "

GRAMME-ATOM.—A quantity of an elementary substance, such that the number of grammes-weight is the same as the atomic number of the element—e.g. 12 grammes of carbon (C=12).

GRAMME-EQUIVALENT.—A number of grammes-weight of a substance, elementary or compound, equal numerically to the quantity of that substance which is chemically equivalent to unit weight of hydrogen—e.g. 8 grammes of oxygen, 9 grammes of water.

GRAMME-MOLECULE.—A quantity of a substance, elementary or compound, such that the number of grammes and the molecular weight are numerically the same—e.g. 32 grammes of oxygen (O_2=32), 18 grammes of water (H_2O=18).

Grammiche'le, a town of Sicily, 33 miles SW. of Catania, on a mountain-ridge, 1768 feet above sea-level. Beautiful marbles are produced in the neighbourhood. It was founded in 1693 in place of the neighbouring town of Ochiolà, which had been destroyed by an earthquake. Pop. 11,804.

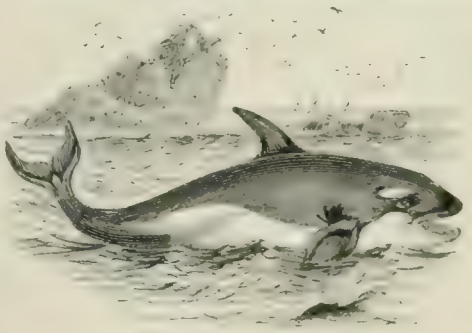
Grammont (Fr.; Belg. *Geeraerdsbergen*), a small town in the Belgian province of East Flanders, on the Dender, 14 miles by rail S. by E. of Ghent, with an episcopal seminary, and famous manufactures of black lace. Pop. 9836.

Gramont, or GRAMMONT, PHILIBERT, COMTE DE, a celebrated French courtier, was born in 1621. His grandfather was husband to 'la belle Corisande,' one of the many mistresses of Henry IV. While still very young he distinguished himself as a volunteer under Condé and Turenne, and quickly became a favourite at the court of Louis XIV., from his handsome figure, lively wit, and wonderful luck at play. But his gallantries brought him exile from France in 1662. He found a pleasant refuge and congenial society among the merry profligates that thronged the court of Charles II. of England. Here he took his share in all the intrigues that formed the sole occupation of those gilded reprobates of both sexes who modelled their morals on the king's. He married, but not without compulsion, Elizabeth Hamilton, sister of Count Anthony Hamilton, with whom he afterwards returned to France, there to live as he had lived in England. Ninon de l'Enclos said he was the only old man who could affect the follies of youth without being ridiculous. At eighty he inspired his memoirs or at least revised them when written by his brother-in-law, Anthony Hamilton (1646–1720). This strange book is a remarkable revelation of a world of intrigue and villainy, saved from detestation only by its brilliancy and wit. It is written with equal grace and vigour, and its portraits are among the best materials for the domestic history of the time. Gramont survived till 1707. His *Mémoires* was first printed anonymously in 1713, and an English translation by Boyer was published in 1714. The work, though actually the composition of a foreigner, is an acknowledged French classic, and has often been reprinted, sometimes in forms as sumptuous as the editions by Renouard (1812) and Gustave Brunet (1859). The best English editions are Edwards's (1793), Malleville's (1811), Bohn's (1846), and that published by John C. Nimmo in 1889.

Grampians, a name very loosely applied to the mountain-system of the Scottish Highlands. Some, for instance, restrict it to a 'chain' of heights bordering the Lowland plain from Dumbarton to Stonehaven, whilst others include a 'range' extending from Stonehaven to Ben Nevis, as well as the Cairngorm group, Schiehallion, &c. Hector Boece adopted the name in 1527 from Tacitus's *Mons Grampius* or *Granpius*, the scene in 86 A.D. of Agricola's crushing defeat of Galgacus. Where that battle was fought has itself been hotly contested. Ardoch, Dalginross, near Comrie, and Urie, near Stonehaven, are sites named, also the junction of the Isla and Tay. See also VICTORIA.

Grampound, a decayed Cornish village, till 1824 returning two members to parliament, 7 miles SW. of St Austell. Pop. 495.

Grampus (a sailor's corruption of Ital. *gran*



Grampus (*Orca gladiator*).

pesce, or Span. *gran pez*, 'great fish'), a cetaceous animal, common in almost all seas from Greenland

to Tasmania, not unfrequent in the Atlantic, and well known on the British coasts. Constituting the genus Orca, it is the largest of the Delphinidæ, often more than 20 feet in length; its form spindle-shaped, but thicker in proportion than the porpoise, from which it also differs in the much greater height of its dorsal fin, in its rounded head, and its permanent conical teeth. It is remarkable for its great strength and voracity, and is the only cetacean which preys systematically on its warm-blooded kindred—on small dolphins and porpoises, belugas, and even whales—the grampuses, or 'killers' as English sailors also call them, assembling in herds to pursue whales.

Gran, a royal free-town of Hungary, is situated on the right bank of the Danube, here crossed by a bridge of boats, 25 miles NW. of Pesth, and opposite the mouth of the river Gran (length, 150 miles). The town is the see of the primate of Hungary, and its great domed cathedral (1821–56), on the castle hill, rivals in its magnificent proportions St Peter's at Rome. The palace of the prince-archbishop, who is primate of Hungary, and has a rent roll of £80,000, is the chief of many buildings in connection with the cathedral. The warm mineral springs of Gran have also some fame. Pop. (1890) 9349. Gran was the cradle of Christianity in Hungary; here St Stephen, the first king, was born in 979, and baptised and crowned in 1000. In the next two centuries it became the greatest commercial town in the kingdom; the old name, *Istrogranum* ('Danube grain-town'), appears now in the Magyar *Esztergom*, and the Hungarian-Latin *Strigonium*. Gran's fortunes never recovered from the storming by the Tartars in 1241.

Granada, an ancient Moorish kingdom of Spain, embracing the south-eastern portion of Andalusia, and now divided into the three modern provinces of Granada, Almeria, and Malaga, the united areas of which amount to 11,062 sq. m., and the united pop. (1877) 1,328,464; (1887) 1,361,456. Except in the narrow strip of coast region along the Mediterranean, the surface is a succession of mountain and plateau rising in the centre to the snow-capped Sierra Nevada; but the soil is fertile, and the ancient Granada, which became an independent kingdom after the fall of the caliphate of Cordova in 1236, supported a population of 3 millions, and sent 100,000 men into the field. From 1246 the Moorish kings were obliged to recognise the supremacy of the kings of Castile. A quarrel, however, which arose between the vassal king of Granada and Ferdinand and Isabella in the 15th century resulted in a war of eleven years' duration, the result of which was the complete conquest of Granada by the Spaniards in 1492, and the total destruction of Moorish authority in Spain.

The modern province of Granada has an area of 4928 sq. m., which includes the highest mountains in the Peninsula, and one of the most picturesque regions in Europe. A great portion belongs to the basins of the Jenil and the Fardes (Guadiana Menor), tributaries of the Guadalquivir; the Guadalfeo and other streams flow into the Mediterranean. The climate is warm, but tempered by the snow-clad mountain-ranges; the fruitful soil yields the products of both the temperate and subtropical zones. Neither the mineral springs nor the rich deposits of salt, iron, lead, copper, zinc, sulphur, marble, and alabaster are much worked; the silk industry, formerly important, has nearly disappeared, and the manufactures are now chiefly weaving, sugar and brandy refining, &c.; and the trade of the province, hindered by a rock-bound, inhospitable coast and the absence of roads, is unimportant. Pop. (1877) 479,066; (1887) 480,594.

GRANADA, the chief town of the province, and formerly capital of the kingdom, has sadly declined since the days of its Moorish masters, but still ranks as one of the larger cities of Spain. It lies at the foot of the Sierra Nevada, on and between two hills, the southernmost being the site of the famous Alhambra (q.v.), and is 2245 feet above sea-level, and 126 (by rail 179) miles E. by S. of Seville. It overlooks a fertile and extensive plain, and stands on the right bank of the Jenil, which is here joined by the Darro. The northern hill is occupied by the Albaicin, the oldest part of the town. The main part of the town lies in the plain to the west of this, on both sides of the Darro, which is here mostly arched over; and the wide suburbs of Elvira and Antiqueruela stretch farther to the west and north. The modern town is commonplace and dull, with wide streets, open squares, and many-windowed houses; but the old houses, with their flat roofs, turrets, many-coloured awnings, balconies, and fountains, preserve still a half oriental aspect, and the labyrinths of narrow, tortuous, ill-paved lanes that for the most part pass for streets here and there offer picturesque views. The chief centres of commercial activity are the old and handsome square known as the Vivarrambla and the Zacatin, or old bazaar, a street which still retains much of the Moorish style. On the outskirts of the town there is a shady Alameda. Granada is the seat of an archbishop, and has a university (1531) attended by nearly 1000 students. The cathedral, begun in 1529, is profusely decorated with jaspers and coloured marbles, and contains the tombs of Ferdinand and Isabella, and of Philip I. and his consort Juana, fine specimens of Italian Renaissance sculpture, doubtfully attributed to Torrigiano. In the monastery of San Geronimo the 'Great Captain,' Gonsalvo di Cordova, is buried. The industry and trade of the town are inconsiderable. Pop. (1877) 76,108; (1887) 66,778. The modern city of Granada was founded by the Moors in the 8th century, not far from the ruins of an ancient Celtiberian town, Illiberis, and rapidly rose to distinction as a wealthy trading city and as a seat of arts and architecture. According to the common account, about 1350 the pop. numbered 200,000, and at the time of the Spanish conquest reached 400,000; the city was surrounded by a wall fortified with 1030 towers, contained 70 libraries, and was the seat of 50 schools of learning. But this is more or less legendary.—The etymology of Granada is doubtful, but the worst explanation is that which makes the name mean pomegranate. The Moors called it *Karnattah* or *Karnattah-al-Yahoud*—i.e. Granada of the Jews, to whom this quarter of the early town was given up, the Arabs retaining Illiberis, which they called Elvira. Karnattah possibly signifies the hill or city of strangers. See Prescott's *Ferdinand and Isabella* (1837); Washington Irving's *Conquest of Granada* (1829); Lafuente y Alcantara, *Historia de Granada* (4 vols. Gran. 1843).

Granada, a department and city of Nicaragua. The department, lying between the Pacific and Lakes Nicaragua and Managua, has an area of nearly 2600 sq. m.; it is mostly a level savannah, but contains the volcano of Masaya and the Mombacho peak (4500 feet). Pop. about 70,000.—The city stands on the north-west side of Lake Nicaragua, and is connected with Managua by rail. Founded in 1522, it was formerly the chief town of the republic, but has suffered greatly from the civil wars; it is still, however, of some importance as a trading centre. Pop. about 10,000.

Granadilla, the edible fruit of *Passiflora quadrangularis*. See PASSION-FLOWER.

Granby, JOHN MANNERS, MARQUIS OF, an English general, the eldest son of the third Duke

of Rutland, was born January 2, 1721. He entered the army, and soon after attaining the rank of lieutenant-general (1759) was sent to Germany as second in command, under Lord George Sackville, of the British troops co-operating with the king of Prussia. After the battle of Minden he was appointed commander-in-chief of the British troops, and held that post during the remainder of the Seven Years' War. After the peace of 1763 he was constituted master-general of the ordnance, and in 1766 commander-in-chief of the army. He died at Scarborough 19th October 1770. Though very popular in his time, as is evidenced by the frequency with which his portrait was a public-house sign, he was the subject of some of Junius's most terrible invectives. His military qualities appear to have been overrated. See Life by W. E. Manners (1899).

Gran Chaco, an extensive central tract of South America, extending from the southern tropic to 29° S. lat., and bounded on the E. by the Paraguay and Paraná, and on the W. by the Argentine provinces of Santiago del Estero and Salta. Its area, about 180,000 sq. m., exceeds that of Great Britain and Ireland by one-half. The portion south of the Pilcomayo belongs to Argentinia, and the remaining third to Paraguay; but the possession of the upper section of the Pilcomayo is disputed by Bolivia. The country rises gradually from the Paraná towards the north-west as far as 25° 40′ S. lat., when it dips to the valley of the San Francisco —part of a great depression extending through Bolivia nearly to the frontier of Peru, and subject to annual inundations. The Chaco is watered principally by two long, narrow, and tortuous streams, the Bermejo and the Pilcomayo, flowing south-east in courses generally parallel, and about 180 miles distant from each other. Only the former has been explored throughout, but it is known that both possess an unusual number of obstructions, though these are quite removable, consisting mainly of shallows caused by the compact argillaceous bed which is a geological characteristic of the whole Chaco subsoil. The bed of the Bermejo also oscillates backward and forward, and in 1870–72 the river opened up a new channel (known as the Teuco) for nearly 200 miles. The most northern part of the Chaco is an extremely arid zone, but the banks of the upper Pilcomayo are fertile and its sands auriferous. To the north of the Bermejo there are numerous and wide marshes and stretches of jungle, drained by many small streams; but the land is well wooded, chiefly with vast seas of palms (here an indication, however, of marshy lands subject to inundation, as the local algaroba is of dry, high land), while south of the Bermejo the primeval forest extends into Salta. The annual rainfall is probably 80 inches, all concentrated into the six months from November to May; then wide sections become almost a lake district, whilst in seasons of extraordinary floods the Paraguay and the other great rivers create a vaster sea than the Nile. Thus much of the region is of modern alluvial formation, and exceedingly fertile. A very dry season succeeds, and some districts are then utterly waterless, or the wells that have been sunk are impregnated with salt. The average temperature is 80° F.; the climate is said to be equable, and in the southern section suitable to colonists of the Anglo-Saxon race. Since 1537, when the first explorer, Captain Juan de Ayolas, marched with 250 men into the wilderness from which none ever returned, numerous expeditions have been sent out from the surrounding countries; but the savage tribes (still unsubdued throughout the unexplored interior), swamps, lagoons, and floods defeated all early attempts to open up the country. In 1884 garrisons were established along the Bermejo, and since 1885 permanent settlements have been made. Already there are many agricultural colonies and small towns along the Paraguay, connected by rail and telegraph; the Bermejo lands, on both banks for 400 miles from its mouth, have been conceded by the Argentine government for various enterprises; thousands of hands are employed in the timber trade, and steam sawmills are in operation; cattle-raising and farming are carried on, and from the sugar-cane refined sugar and rum are manufactured. Concessions also have been granted for railways from Corrientes to the Bolivian frontier. See an interesting paper by Captain John Page in *Proc. Roy. Geog. Soc.* (1889).—*Chacu,* the Quichua word for 'hunt,' may refer to the great Indian *battues;* but under the Incas it was applied to the numbering of flocks, and so came to signify wealth —*Gran Chaco* thus meaning 'great riches.'

Grand-combe, La, a town in the French department of Gard, 41 miles NNW. of Nimes. Near it are very important collieries. Pop. 6111.

Grandees (Span. *grandes*), since the 13th century the most highly privileged class of nobility in the kingdom of Castile, in which the members of the royal family were included. Their honours were hereditary; they held lands from the crown on the tenure of military service, were exempted from taxation, could not be summoned before any civil or criminal judge without a special warrant from the king, and could leave the kingdom, and even enter the service of a foreign prince at war with Castile, without incurring the penalties of treason. Besides this, they had the right of being covered in the presence of the king. In the national assemblies they sat immediately behind the prelates and before the titled nobility (*titulados*). Under Ferdinand and Isabella they were deprived of most of their peculiar privileges; and Charles V. converted them from an independent feudal nobility into a dependent court nobility. Under Joseph Bonaparte their dignities and privileges were entirely abolished; but they were partially regranted at the subsequent restoration. Grandees are still members of the senate in their own right.

Grand Forks, capital of Grand Forks county, North Dakota, on the Red River of the North, opposite the mouth of Red Lake River, is about 55 miles N. of Fargo, at the intersection of two railways. It has several flour and saw mills, iron-works, and a brewery, besides a large transit trade in wheat. Pop. 4979.

Grand Haven, capital of Ottawa county, Michigan, on Lake Michigan, and on the south bank of Grand River, 31 miles W. by N. of Grand Rapids by rail. It has a good harbour, with two lighthouses, and ships large quantities of lumber and grain. It contains several lumber-mills and manufactories of wooden wares, &c.; and a medicinal spring renders the place a summer-resort. Pop. 5914.

Grand Jury. See Jury.

Grand Pensionary. See Pensionary.

Grandpré, a village in the French department of Ardennes, on the river Aire, 40 miles NNE. of Châlons. Here on 14th September 1792 Dumouriez was defeated by the Allies.

Grand Rapids, capital of Kent county, Michigan, stands at the head of steamboat navigation on Grand River, here crossed by six bridges, and at the junction of several railways, 60 miles WNW. of Lansing. The river, which enters Lake Michigan 40 miles below, here falls 18 feet in a mile, and across it extend the rapids which give name to the town. Conducted by canals, it

supplies motive-power to numerous sawmills and manufactories of furniture and wooden ware, farming implements, flour, machinery, &c., though steam is now in use in most of the factories: gypsum quarries near the town supply abundant material for stucco plaster and kindred preparations. White bricks are also largely made here, and many of the houses and churches are built of these. The city is the seat of an Episcopal bishop. Pop. (1870) 16,507; (1880) 32,016; (1885) 41,934; (1890) 60,278.

Grand Serjeanty (*magna serjeantia*, or *magnum servitium*, 'great service') was one of the most honourable of the ancient feudal tenures. According to Littleton, tenure by grand serjeanty is where a man holds his lands or tenements of our sovereign lord the king by such services as he ought to do in his proper person to the king, as to carry the banner of the king, or his lance, or to lead his army, or to be his marshal, or to carry his sword before him at his coronation, or his carver, or his butler, or to be one of his chamberlains of the receipt of his exchequer, or to do other like services. These honorary services were expressly retained when the military tenures were abolished in 1661. Strathfieldsaye is held by the Duke of Wellington in grand serjeanty, the service required being the presentation to the sovereign of a flag bearing the national colours on each anniversary of the battle of Waterloo. The service by which the Duke of Marlborough holds the manor of Woodstock is the presentation to the sovereign of a French standard on the anniversary of the battle of Blenheim.

In Scotland grand serjeanty was not known as a separate tenure—that is to say, lands held on condition of honorary services rendered to the sovereign were not attended with any privileges other than those attaching to lands held in a similar manner of a subject superior. In that country a tenure by honorary service was known as a Blanch Holding (q.v.).

Grandson. See GRANSON.

Grandville, the pseudonym of JEAN IGNACE ISIDORE GÉRARD, a French caricaturist, who was born at Nancy, 3d September 1803. In 1828 he first attracted attention by a series of humorous sketches entitled *Les Métamorphoses du Jour*, in which men with animals' faces show forth the follies and foibles of human nature. This was followed by several similar series of satirical caricatures of social relations, as *Animaux Parlants*, *Les Gens Proverbes*, *Les Fleurs Animées*, &c. He also practised political caricature with great success. Besides this line of work, he contributed illustrations to splendid editions of the *Fables* of Lafontaine, *Robinson Crusoe*, *Gulliver's Travels*, &c. Grandville died in Paris, 17th March 1847.

Grangemouth, a rising port in Stirlingshire, 3 miles ENE. of Falkirk. Founded in 1777, and erected into a police-burgh in 1872, Grangemouth has extensive quays and warehouses, docks (including a large one opened in 1882), a graving-dock, and shipbuilding yards. The trade of the port has risen very rapidly. In 1840 the shipping entering and clearing it was 31,686 tons annually; in 1876, 840,326; in 1885, 1,457,991; and in 1894, 1,790,281 (one-third in the foreign trade) tons—the port ranking fifth in Scotland. Since 1887 there has been a regular line of passenger steamers between Grangemouth and London, owned by the Carron Iron Company, whose works are within 2 miles of the port. The principal imports are timber, hemp, flax, tallow, deals, iron, and grain; and the exports are manufactured iron, and coal. Grangemouth is noteworthy as having been the place where some of the earliest experiments in Steam-navigation (q.v.) were made. In 1801 the first *Charlotte Dundas* was built there. Pop. (1831) 1155; (1871) 2569; (1881) 4560; (1891) 6354.

Granger, JAMES, born about 1723, was educated at Christ Church, Oxford, and died vicar of Shiplake, in Oxfordshire, in 1776. He published a long popular *Biographical History of England* (1769; 5th ed. 6 vols. 1824), which was 'adapted to a catalogue of engraved British heads,' and insisted much 'on the utility of a collection of engraved portraits.' His advice led to extraordinary zeal in collecting portraits, and 'grangerised copies' became the name for works embellished with engravings gathered from all quarters—frequently secured by the unconscionable mutilation of valuable books of all kinds. A grangerised Bible, in 45 vols. folio, contained 6000 prints, and was valued at 3000 guineas. An edition of Lefevre's Voltaire in 90 vols. contained 12,000 engravings (mostly portraits), and cost the labour of twenty years; it sold in 1856 for £800. A grangerised Clarendon's Rebellion was illustrated by Mr Sutherland at a cost of £10,000. In 1888 a London bookseller had on sale, for £1500, a copy of Boydell's Shakespeare, extended by the insertion of thousands of plates to 36 volumes; the sale price probably did not represent the cost of the grangerising.

Grangers, an American association of agriculturists, founded by a government clerk named Kelly in 1867, under the title of 'patrons of husbandry.' The society had a ritual and four orders for men and women, and aimed at the social improvement and industrial benefit of the farming class. By 1875 there were as many as 30,000 granges organised, but the number was afterwards reduced by dissensions. In 1888 the association was united with the National Farmers' Alliance, founded in the Western States about 1871; and in 1892 the united body, which had attracted a following amongst working men generally, acquired political importance as the People's Party or Populists, and had to be reckoned with at elections. This party advocates the public ownership of the railways and tramways, direct issue of money by government without the intervention of banks, free coinage of silver, and bi-metallism.

Granicus, the ancient name of a small river of Asia Minor, flowing from the northern side of Mount Ida to the Propontis, and now known as the Kodsha-su. On its banks Alexander the Great (q.v.) defeated the Persians.

Granier de Cassagnac. See CASSAGNAC.

Granite (Ital. *granito*, 'gritty;' Lat. *granum*, 'grain'). This well-known rock is a thoroughly crystalline-granular aggregate of quartz, felspar, and mica. The felspar is generally orthoclase (pink or gray), but some plagioclase is often present. The mica may be muscovite or biotite, and other varieties also occur, but the most common perhaps is muscovite. There is no base or matrix in this rock—the several crystals and crystalline granules, confusedly commingled, being bound together by their faces. In crystallising out, the felspar and mica have interfered with each other's development, so that these minerals rarely assume perfect crystalline forms. The quartz still more rarely appears in the form of perfect or even approximately perfect crystals, but occurs as irregular crystalline granules, or seems to be moulded upon and hemmed in between the other minerals. Fluid cavities are generally plentiful in the quartz. As a general rule the component crystals of granite have separated out in the following order: mica, felspar, quartz. Occasionally, however, it is found that the felspar and the quartz have crystallised together, and thus mutually interfered with each other's form. More rarely the formation of the quartz has even preceded

that of the felspar. All varieties of texture are met with among granites, from very fine-grained up to coarsely-crystalline rocks, in which the component crystals may be several inches in diameter. The coarser-grained kinds are called *pegmatite*. In the variety known as *graphic granite* the quartz is crystallised in the orthoclase, forming alternate zigzag-shaped laminæ, which, on a cross-fracture, present the appearance of Hebrew writing. The accessory minerals, such as beryl, topaz, tourmaline, garnet, sphene, &c., are met with chiefly in irregular cavities, and in such cavities very fine crystals of the essential minerals often occur. Scattered through the body of the rock, however, accessory minerals are not uncommon, especially apatite and sphene, and less frequently zircon—these three minerals occurring as inclusions in the essential minerals. The relative proportion of mica, felspar, and quartz varies; in many granites felspar forms more than half of the bulk of the rock—quartz coming next, and mica last. In other granites there is extremely little quartz, while mica is more plentiful. Sometimes the rock is rendered porphyritic by the appearance of large crystals of orthoclase, embedded in a granitoid or finely-crystalline ground-mass. It is generally the felspar which gives the prevalent colour to a granite—the rock being red or gray according as flesh-coloured or white felspar predominates. Very often dark patches and nodules occur in granite. Sometimes these are fragments of foreign rocks more or less altered; at other times they are composed of the same minerals as the granite itself, but in different proportions—mica often predominating. Veins of similar composition are also found ramifying through granite. These and the patches together are supposed to be 'the result of differentiation accompanying the crystallisation of the original magma'—the dark portions being more basic in composition than the rock in which they occur. Most granites are traversed by lighter-coloured veins—some of which are finer grained and others coarser than the rock in which they appear. The origin of these veins is uncertain. They would appear to be of contemporaneous origin with the granite, and to have sometimes formed in rents of the original pasty magma, possibly by segregation of the minerals from the surrounding mass. The fine-grained veins, on the other hand, were probably injected before the granite had become quite consolidated. It seems certain at least that the rock of the veins and the granite itself originally formed portions of one and the same molten mass.

Amongst varieties of granite may be mentioned *hornblendic granite*, in which hornblende is added to the other constituents. When this is the case, mica is only sparingly present. When schorl (black tourmaline) replaces mica, we have *schorlaceous granite*. *Greisen* is a granular aggregate of quartz and mica. *Aplite* is a fine-grained aggregate of quartz and orthoclase, with sometimes a little mica. These three last-mentioned varieties are met with chiefly in veins proceeding from masses of ordinary granite.

Granite usually occurs in great bosses or amorphous masses—and frequently forms the nuclei of mountain-chains. Its petrographical characters and behaviour in the field prove it to be of igneous origin, at all events in the great majority of cases, and to have consolidated at considerable depths in the earth's crust. Hence it belongs to the Plutonic class of igneous rocks. Some writers have held that certain granites are of metamorphic origin, but the appearances which seem to support this view have of recent years received another interpretation. And although, in the present state of our knowledge, it cannot be asserted that no granite is of metamorphic origin, yet it would appear that granites of demonstrably metamorphic origin have not yet been discovered. Those which are supposed to be of such origin are intimately associated with crystalline schists, which themselves are believed to be the result of metamorphic changes. At one time granite was looked upon as the oldest of primitive rocks, but it is now known to be of various ages. Its presence at the surface is due of course to denudation, which has removed the great masses of rock that originally covered it.

The more durable kinds of granite are largely used as building materials in bridges and engineering-works, and also in public buildings and dwellings. The difficulty of working it makes it expensive, but this is counterbalanced by its great durability. It cannot be cut, like the majority of building-stones, with saws, but is worked first with large hammers, and then with pointed chisels. The success with which the Egyptians operated upon this refractory stone is very extraordinary. They worked and polished it in a way that we cannot excel, if, indeed, we can come up to it, with all the appliances of modern science; and not content with polishing, they covered some of the blocks with the most delicate and sharply-cut hieroglyphics!

The granites best known in the British Islands for ornamental purposes are the gray Aberdeen granite and the reddish-coloured Peterhead granite. Of this last-mentioned variety handsome polished columns for public halls have been constructed. On the Continent granite has been quarried for similar purposes in several countries: as near Baveno in Italy, and in the islands of Sardinia and Elba; in Normandy and Brittany; in southern Sweden, Finland, the Tyrol, Switzerland, &c. In North America granites are worked at a number of places, as in Maine, New Hampshire, Massachusetts, Connecticut, New York, Michigan, and California, and at various places in the Canadian province of Quebec. The rock would probably be more abundantly used than it is, were it not for the fact that in many cases it occurs at elevations and in districts more or less difficult of access.

The soil produced by the weathering of granitic rocks should be fertile, as their component ingredients yield the necessary elements. But in hilly districts, where granite is chiefly developed, the fine clay which results from the decomposition of the felspar is washed away, so that only the quartz sand is left on the slopes—forming a thin, ungrateful soil. In the hollows and flats whither the clay is transported we find generally a cold, stiff, and wet subsoil, which is only worked with difficulty. In low-lying granitic tracts, especially under genial climatic conditions, the soil which results from the weathering of granite is sometimes very fertile. See Geo. F. Harris, *Granite and the Granite Industries* (1888).

Gran Sasso d'Italia ('Great Rock of Italy'), also called MONTE CORNO, from the resemblance to a horn which it presents on the east, is situated on the borders of the Abruzzi, between Teramo and Aquila. It is the highest summit of the Apennines, having an elevation of 9574 feet.

Granson, or GRANDSON, an ancient town in Switzerland, on the Lake of Neuchâtel, 21 miles SW. of Neuchâtel; pop. 1762. Here in 1476 the Swiss defeated Charles the Bold (q.v.).

Grant, in English law, the conveyance of property by deed. Movables are granted when they are comprised in a bill of sale or deed of gift. Incorporeal hereditaments, and interests in land not involving actual possession, were also said to lie in grant; but a freehold in possession could

only be conveyed by livery of seisin—i.e. by solemn delivery of possession. The Real Property Act of 1845 enacted that the immediate freehold might be conveyed by deed of grant. It is no longer necessary to use the word 'grant;' other words, such as 'convey,' will have the same effect. A grant of the reversion of land under lease was formerly completed by the lessee attorning (becoming) tenant to the grantee; but the necessity for attornment is now abolished. In the United States generally livery of seisin is dispensed with, and the term 'grant' applies to all transfers of real property.

Grant, FAMILY OF. Among various conflicting theories as to the origin of this family, the most probable is, as the name seems to indicate, that it is of Norman extraction, and that it was introduced into Britain at the Conquest. Occasionally it appears in parts of England; but by the middle of the 13th century it had established itself in the north of Scotland—Laurence le Grant holding the responsible office of sheriff of Inverness in 1263. He and his descendants acquired large territories in the great Caledonian Glen, and also in Strathspey, Freuchie, now Castle Grant, near Grantown, becoming their principal barony and residence. The sixth laird of Freuchie was knighted by King James VI., and his grandson had his lands erected into the regality of Grant—whence their designation since. Sir Ludovick Grant, fourth laird of Grant, married as his second wife, Lady Margaret Ogilvie, daughter of James, fifth Earl of Findlater and Seafield, and, through this marriage, their grandson succeeded in 1811 to the earldom of Seafield, assuming the surname of Ogilvie in addition to that of Grant. Through another marriage, a younger brother of the fourth laird of Grant succeeded to the estates of the Colquhouns of Luss, and, assuming the surname of Colquhoun, became the ancestor of the present family of that name. *The Chiefs of Grant* (3 vols. 4to, 1883), prepared by Sir William Fraser, K.C.B., for the family, presents a history of its descent, and also shows the dispersion of its numerous cadet branches, many members of which have become distinguished in various spheres of life.

Grant, SIR ALEXANDER, of Dalvey, was born at New York in 1826, and represented one of the oldest branches of the Clan Grant. Educated at Harrow and Balliol College, Oxford, he graduated B.A. in 1848, and was elected to an Oriel fellowship. Here he edited the *Ethics of Aristotle* (1857), with English notes, a work which still maintains a reputation by its suggestive preliminary essays. He succeeded as baronet in 1856, was appointed inspector of schools at Madras in 1858, and became professor of History in Elphinstone College there; then its principal; and afterwards vice-chancellor of Elgin College, Bombay, in all which positions he did much to promote the interests of education in India. On the death of Sir David Brewster he was in 1868 chosen as principal of the university of Edinburgh, an office which he enjoyed for sixteen years, during which took place the inauguration of the new medical school, and the tercentenary celebration of the university. His *Story of the University of Edinburgh* (1884) was published in connection with the latter event. Earlier works were *Aristotle* and *Xenophon*, in Blackwood's 'Ancient Classics;' and *Essays Studies* (1870), a volume of essays written by various scholars. The universities of Edinburgh and Glasgow conferred upon him the degree of LL.D., and Oxford that of D.C.L. He married, in 1859, Susan, daughter of Professor Ferrier of St Andrews, and died suddenly on 1st December 1884.

Grant, MRS ANNE, a miscellaneous writer, whose works were among the first to draw public attention to the romantic scenery and peculiar manners of the Scottish Highlands, was born in Glasgow, 21st February 1755. She was the daughter of a British officer, Duncan M'Vicar, who became barrack-master of Fort-Augustus. She married in 1779 the Rev. James Grant, formerly chaplain of the fort, minister of Laggan. Left a widow in destitute circumstances in 1801, Mrs Grant published by subscription a volume of *Poems* (1803), which were well received; *Letters from the Mountains* (1806), a highly popular work; *Memoirs of an American Lady* (1808); *Essays on the Superstitions of the Highlanders of Scotland* (1811), &c. In 1825 she received a pension of £100 a year, and by legacy from Sir William Grant, Master of the Rolls, she enjoyed a similar annuity. She died on 7th November 1838. A memoir of her life, and a selection from her correspondence, forming a continuation of her *Letters from the Mountains*, were edited by her son, J. P. Grant, in 1844.

Grant, CHARLES, LORD GLENELG, son of Charles Grant, sometime M.P. for Inverness-shire, and a distinguished director of the East India Company, was born at Kidderpur, near Calcutta, in 1778. He was of the Grants of Sheuglie, cadets of the Grants of Grant. He was educated at Magdalene College, Cambridge, where he took his degree of M.A. in 1804. In 1805 he published a poem on the *Restoration of Learning in the East*, which had won the university prize awarded by Dr Claudius Buchanan. He was called to the bar in 1807, but never practised. In 1811 he was elected M.P. for the Inverness district of burghs; and afterwards, succeeding his father in the county representation, continued in the House of Commons till 1835, when he was raised to the peerage. Grant held for five years the office of a Lord of the Treasury, and in 1819 was appointed Secretary for Ireland, which he continued to be for about two years. As Irish Secretary he endeavoured to suppress the Orange demonstrations, to secure the impartial administration of justice, and to devise a system of national education adapted for Catholics as well as Protestants. From 1823 to 1827 Grant was Vice-president of the Board of Trade; from 1830 to 1834 President of the Board of Control; and from 1834 to 1839 Secretary of State for the Colonies. After this he withdrew in a great measure from public affairs, but supported the Liberal party by his vote. He died at Cannes, in France, in 1866, unmarried. Lord Brougham pronounced Grant to be 'the purest statesman he had ever known.' He was an eloquent speaker, though, partly from diffidence and partly from indolence, he spoke but seldom. Some of his despatches as colonial secretary, on the rights of the natives in the colonies, on repressing idolatry, and abolishing slavery throughout the British possessions in South Africa, are models of elevated and just thought, and of fine impressive English.

Grant, SIR FRANCIS, fourth son of Francis Grant of Kilgraston, Perthshire, was born in Edinburgh on 18th January 1803. He was educated at Harrow and the university of Edinburgh for the Scottish bar, but abandoned that profession to follow his natural genius for painting. A noble portrait by Velasquez is said to have exercised an especial influence over the young painter's future career. His first picture was exhibited in 1834, when he at once took rank among the best portrait-painters of the day, and was regarded as a worthy successor of Lawrence. His most famous works are those in which he has combined the likenesses of distinguished characters with scenes of English sport. The 'Meet of H.M. Staghounds,'

painted in 1837 for Lord Chesterfield, and containing no less than forty-six portraits; the 'Melton Hunt,' executed for the Duke of Wellington; and the 'Cottesmore,' for Sir R. Sutton, are the best known in this class. Among his other paintings may be mentioned the equestrian portraits of the Queen and Prince Consort for Christ's Hospital; the picture of the beautiful Marchioness of Waterford; and those of Lords Palmerston, Russell, Gough, Macaulay, Hardinge, &c. In 1842 Grant was elected Associate, and in 1851 Academician. In 1866 he became President of the Royal Academy and was knighted. In 1870 Oxford conferred upon him the degree of D.C.L. He died on 5th October 1878.

Grant, JAMES, of Corrimony, in Inverness-shire, a cadet of the Grants of Grant, born in 1743, died in 1835, was author of *Essays on the Origin of Society* (1785) and *Thoughts on the Origin and Descent of the Gael* (1814).

Grant, JAMES, military novelist, was born in Edinburgh, 1st August 1822, and in 1832 sailed with his father, an army officer, for Newfoundland. Home again, in 1839 he was gazetted to an ensigncy in the 62d Foot, but within a few years resigned his commission, and turned to literature. Having already contributed copiously to the *United Service Magazine* and the *Dublin University Magazine*, he in 1846 published his first book, *The Romance of War*. Since then he supplied his legion of readers with a long and close series of novels and histories, illustrative mainly of war, and, more particularly the achievements of Scottish arms abroad. Among his many works may be mentioned *Adventures of an Aide-de-Camp; Adventures of Rob Roy; Frank Hilton, or the Queen's Own; Bothwell, or the Dark Days of Queen Mary; The Yellow Frigate; Harry Ogilvie;* and *Old and New Edinburgh*. Most of his works have reappeared in German and Danish, as also a few in French. In 1875 Cardinal Manning received him into the Roman communion. He died in London, 5th May 1887.

Grant, COLONEL JAMES AUGUSTUS, C.B., F.R.S., was a son of the Rev. James Grant of Nairn, where he was born in 1827. Having been educated at the grammar-school and Marischal College, Aberdeen, he was in 1846 appointed to the Indian army. His services at the battle of Gujerat, under Lord Gough, gained him the medal and two clasps, and his further services in India, in the course of which he was wounded, were honoured by the Mutiny medal and clasp for relief of Lucknow. With Captain Speke he explored (1860–63) the sources of the Nile. He also received the medal for services in the Abyssinian Expedition of 1868. Among his publications are *A Walk Across Africa;* 'Summary of the Speke and Grant Expedition,' in the *Jour. Roy. Geog. Soc.* (1872); *Botany of the Speke and Grant Expedition;* and *Khartoum as I saw It in 1863*. A gold medallist of the Royal Geographical Society, he died 10th February 1892.

Grant, SIR JAMES HOPE, general, brother to Sir Francis, was born at Kilgraston, Perthshire, 22d July 1808. He first saw service in the Chinese war of 1842, and next distinguished himself at Sobraon, Chillianwalla, and Gujerat in the two Sikh wars. During the operations of the Indian Mutiny Grant, who had risen to the rank of lieutenant-colonel, took a leading part, assisting in the recapture of Delhi (20th September), in the relief of Cawnpore, and in the retaking of Lucknow, and he commanded the force which effected the final pacification of India. In 1859 he conducted the war against China, defeating the enemy three times under the walls of Pekin, assaulting the Taku forts, and finally capturing the capital of the empire, for which work he was created G.C.B. After commanding the army of Madras from 1861 to 1865, he returned to England, and was made general in 1872. He died in London, 7th March 1875. From his journals appeared *Incidents in the Sepoy War of 1857–58* (1883) and *Incidents in the China War of 1860* (1875), edited by Col. H. Knollys, who also published a Life of him (2 vols. 1894).

Grant, MRS, of Carron, author of the popular song, 'Roy's Wife of Aldivalloch,' was born near Aberlour, Banffshire, in 1745. She was twice married—first to her cousin, Captain James Grant of Carron, in Strathspey; and afterwards to Dr Murray, a physician in Bath. She died at Bath in 1814.

Grant, ULYSSES SIMPSON, eighteenth president of the United States, was born at Point Pleasant, Clermont county, Ohio, April 27, 1822. He was of Scottish ancestry, but his family had been American in all its branches for eight generations. Ulysses was the eldest of six children born to Jesse R. Grant and his wife Hannah Simpson, and assisted his father on the farm in summer, attending the village school during the winter. In the spring of 1839 he was appointed to a cadetship in the United States Military Academy, and graduated in 1843. He was commissioned brevet second-lieutenant, and assigned to duty at Jefferson Barracks, Missouri. In May 1844 he accompanied his regiment, the Fourth Infantry, to Louisiana, and in September 1845 he was commissioned second-lieutenant, and joined the army of occupation under General Zachary Taylor. Grant participated in the battles of Palo Alto and Resaca de la Palma, and was also present at the capture of Monterey. Later the Fourth Infantry embarked for Vera Cruz, to join the army of General Winfield Scott, and Grant took part in all the battles of Scott's successful campaign and in the final capture of the city of Mexico. In the summer of 1848 his regiment returned to the United States, when he obtained leave of absence, and in August of that year was married to Julia B. Dent, of St Louis, by whom he had three sons and a daughter, the eldest of whom, Colonel Frederick D. Grant, was in April 1889 appointed American Minister to Austria. Lieutenant Grant served at various posts; was in 1853 appointed to a captaincy; and in the following year resigned his commission, and settled on a farm near St Louis, Missouri.

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When the war began in April 1861 Grant was residing in Galena, Illinois; he immediately offered his services to the government, and in June he was appointed colonel of the 21st Regiment of Illinois Infantry, with which he was sent to Missouri. In August he was advanced to brigadier-general of volunteers, and assigned to the command of a district, and in November he fought the battle of Belmont. In February 1862 he captured Fort Henry, and ten days later Fort Donelson, with 14,623 prisoners, for which victories he was made major-general of volunteers. In April Grant fought a two days' battle at Shiloh, amongst the severest of the war, in which General A. S. Johnston, commanding the Confederate army, was killed. After various unsuccessful movements against Vicksburg, which commenced in the November of 1862, Grant crossed the Mississippi, April 30, 1863, defeated the enemy at Port Gibson and at Champion Hill, and drove them behind their entrenchments at Vicksburg, to which place he laid siege. After many assaults, the stronghold surrendered conditionally on July 4, 1863, with 31,600 prisoners and 172 cannon, and the Mississippi was opened from its source to its mouth. In October Grant was ordered to Chattanooga,

where he fought a battle, capturing the enemy's entire line, and driving him out of Tennessee. In March 1864 Grant, having previously been made a major-general in the regular army for his victory at Vicksburg, was promoted to the grade of lieutenant-general, and assigned to the command of all the armies of the United States, with his headquarters with the army of the Potomac. His plan of campaign was to concentrate all the national forces into several distinct armies, which should operate simultaneously against the enemy, Sherman moving toward Atlanta, while Grant himself accompanied the army of the Potomac against Richmond. During the night of May 4 the latter crossed the Rapidan, encountered General R. E. Lee in the Wilderness, and fought a desperate three days' battle, one of the fiercest of modern times. Grant moved forward on the 7th, and fought again at Spottsylvania Courthouse on the 10th, and still again on the 12th, on which occasion he captured an entire division of the Confederate army. The smoke of battle hung over the mighty hosts for six days, while the North remained in a state of suspense bordering upon agony; but on the 11th Grant wrote to Washington, 'I propose to fight it out on this line, if it takes all summer.' Thus, fighting and flanking, ever pursuing the offensive, and daily drawing nearer to Richmond, he at length drove the enemy within the defences of that city, and there held him in a vice, while he left to his lieutenants —Sherman, Sheridan, and Thomas—a harvest of laurels by active movements and successful battles. On March 29, 1865, there began a week's hard fighting, at the close of which Lee surrendered his entire army at Appomattox Courthouse, April 9, receiving from his victor most generous terms. The fall of Richmond substantially ended the war, and Grant returned to Washington to prepare his report of the operations of the armies of the United States from the date of his appointment to command the same, and to muster out nearly a million of troops that the country no longer required.

In July 1866 Grant was advanced to the grade of full general, and in May 1868 he was nominated for the presidency by the Republican convention, and in the following November was elected. Out of the 294 electoral votes Grant received 214, and Horatio Seymour, the Democratic candidate, 80. He was again elected to the presidency in November 1872, thus filling the office of chief-magistrate for eight years. Among the most important events of his administration were the adoption in 1869 of the fifteenth amendment to the constitution, which guaranteed the right of suffrage without regard to race, colour, or previous condition of servitude; and the peaceful settlement of the 'Alabama Claims' (see ALABAMA). After retiring from the presidency, General Grant spent two years in foreign travel, receiving unusual attentions from the rulers of the various countries which he visited in his tour round the world. In June 1880 his name was again presented to a Republican convention, but, chiefly owing to a traditional sentiment against a third term of the presidency, the nomination was given to James A. Garfield. In 1881 Grant purchased a house in New York, where he afterwards passed his winters, while his summers were spent in his seaside cottage at Long Branch, New Jersey. Finding himself unable with his income to properly maintain his family, he became a partner in a banking-house in which one of his sons and others were interested, bearing the name of Grant and Ward, and invested all his available capital in the business, but taking no part in the affairs of the firm, which were left almost entirely in the hands of the junior partner. In May 1884 the house, without warning, suspended, and it was then discovered that two of the partners had robbed the general and his family of all they possessed. Until this time Grant had refused all solicitations to write the history of his military career; but now, finding himself bankrupt, and with the hope of providing for his family, he began the preparation of his personal memoirs. The contract with his publishers was made February 27, 1885, and the work appeared about a year later. In the summer of 1884 he complained of a soreness in his throat, and an examination detected the presence of cancer at the root of the tongue. The sympathies of the nation were now aroused, and on March 4, 1885, congress passed a bill creating him a general on the retired list, thus restoring him to his former rank in the army, which he had lost on accepting the presidency. It may be doubted if since the world began any book has been written under similar conditions; the dying soldier, suffering constant and at times the severest agony, yet struggled on successfully, completing his literary labours only four days before his death at Mount McGregor, near Saratoga, New York, 23d July 1885. His remains were removed to New York, and on August 8 were interred with great pomp in Riverside Park, overlooking the Hudson. Many lives of Grant have been written, the most valuable of which is his own (2 vols. 1885-86), a work that brought his widow no less than $500,000.

Grantham, a market-town of Lincolnshire, on the left bank of the Witham, 25 miles SSW. of Lincoln, and 105 NNW. of London. It lies on the ancient Ermine Street, and is an important junction on the Great Northern Railway; whilst a canal (1793), 30 miles long, connects it with the Trent near Nottingham. High over the red-tiled brick houses soars the noble gray spire (278 feet high) of St Wolfran's Church, which, in style mainly Early English of the 13th century, has been finely restored by the late Sir G. G. Scott since 1865. An Eleanor cross was demolished in 1645, and a castle has left no trace; but the quaint Angel Inn is still standing, in which Richard III. signed Buckingham's death-warrant. Of King John, too, Grantham has memories, and of Oliver Cromwell, who here on 13th May 1643 won his first success; but the town's greatest glory is Sir Isaac Newton, who during 1655–56 idled, fought, and rose to be head-boy in its grammar-school. A bronze statue of him by Theed was erected in 1858. The said school was founded by Bishop Fox in 1528, re-endowed by Edward VI. in 1553, and reconstituted in 1876. The manufacture of agricultural implements, malting, and brick-making are the chief industries. Grantham was incorporated by Edward IV. in 1463, and from then till 1885 returned two members to parliament a number reduced now to one. The borough boundary was largely extended in 1879. Pop. (1851) 10,873; (1871) 13,250; (1881) 17,345, of whom 16,886 were within the municipal borough; (1891) 17,170. See the local histories of Turnor (1806), Marrat (1816), and Street (1857).

Grant Land, a North Polar region, lying north of Grinnell Land, between 81° and 83° N. lat., discovered by Hayes, Hall, and Nares in 1875, and partly explored by Nares, who wintered on its coasts, in the most northerly latitude (82° 27′) in which the winter has been passed by any ship.

Granton, a harbour on the Firth of Forth, 3 miles NNW. of Edinburgh. It was constructed by the Duke of Buccleuch in 1835–45 at a cost of nearly a quarter of a million.

Grantown, a village of Elginshire, ¾ mile from the Spey's left bank, and 142 miles by rail N. by W. of Edinburgh. Founded in 1776, and created a police-burgh in 1890, it is a popular holiday resort. Pop. 1423.

Granulations, the materials of new texture as first formed in a wound or on an ulcerated surface. See INFLAMMATION, CICATRISATION, WOUNDS, ULCER.

Granulite, or LEPTYNITE, a schistose but sometimes massive aggregate of quartz and orthoclase with garnets. The garnets are disseminated irregularly, and are not infrequently accompanied by Kyanite (q.v.). This rock is classed with the crystalline schists.

Granvelle, ANTOINE PERRENOT DE, Cardinal and statesman (whose name out of France was subsequently spelt Granvella), was born in 1517 at Ornans in Burgundy. He studied law at Padua, and theology at Louvain. A canon for a short time at Besançon, he was in 1540 appointed Bishop of Arras. His father now chancellor of the empire under Charles V., he was entrusted with many diplomatic missions, which he discharged with marked ability. Succeeding his father in the chancellorship in 1550, he accompanied Charles V. in the flight from Innsbruck, and framed the treaty of Passau, 1552. On the abdication of Charles in 1555 he transferred his services to Philip II. In 1559 he was appointed prime-minister to Margaret of Parma in the Netherlands. In 1560 he was created Archbishop of Malines, and next year was made cardinal. Such, however, was the hostility which his policy of repression provoked in the Low Countries that at the king's advice he retired in 1564 to Franche Comté. After six years of comparative quiet he in 1570 represented Spain at Rome in drawing up a treaty of alliance with Venice and the papal see against the Turks. For five years (1570–75) he successfully held the office of viceroy of Naples. He died at Madrid in 1586.

Granville, a fortified seaport in the French department of La Manche, is situated on a rocky promontory on the English Channel, 23 miles NE. of St Malo. The 15th-century church and a hydrographic college are the principal institutions. Chief industries, fishing (oysters and cod), shipbuilding, manufacture of brandy, chemicals, ironware, and tanning; chief exports, fish and buildingstone; chief imports, salt, manure, corn, and flour. Pop. (1886) 11,513. The town has been captured by the French (1450) and the English (1695), and unsuccessfully besieged by the Vendéans (1793) and the English (1803).

Granville, EARL. See CARTERET.

Granville, GEORGE LEVESON-GOWER, second EARL, statesman, was born May 11, 1815, being the eldest son of the first earl. He was educated at Eton and Oxford, and entered parliament in 1836 as member for Morpeth, exchanging that seat for Lichfield in 1840. His long and intimate acquaintance with foreign politics began at this time, and he filled for a brief period the post of Under-secretary for Foreign Affairs. He was a consistent Liberal and a free-trader. He succeeded to the peerage in 1846, and five years later entered the cabinet of Lord John Russell, holding the seals of the Foreign Office. From that time forward he held office in every Liberal ministry. He became President of the Council in 1853, and leader of the House of Lords in 1855. He laboured arduously in connection with the great exhibitions of 1851 and 1862. Lord Granville was charged to form a ministry in 1859; but having failed to do so, he joined Lord Palmerston's second administration. He retired with Earl Russell in 1866, having the preceding year been made Lord Warden of the Cinque Ports. In December 1868 he was appointed Colonial Secretary in Mr Gladstone's first ministry, and on the death of Lord Clarendon in 1870 became Secretary for Foreign Affairs. He arranged the treaty between England, France, and Prussia guaranteeing the independence of Belgium; and confirmed with Prince Gortschakoff the agreement that Afghanistan should form an intermediary zone between England and Russia. His lordship went out of office in 1874, took the temporary leadership of the Liberal party on Mr Gladstone's retirement in 1875, and for six years led the opposition in the House of Lords with ability and spirit. In 1880 he again became Foreign Secretary under Mr Gladstone, and displayed considerable diplomatic skill in matters relating to the Berlin Treaty, the occupation of Tunis, and the revolt of Arabi Pasha in Egypt. He issued a circular note to the powers on Egyptian reforms, and in 1884 convened a conference on Egyptian finance, which proved abortive owing to the hostile attitude of France. Troubles in the Soudan, difficulties with Germany in consequence of Prince Bismarck's colonial schemes, differences with France, and the threatened rupture with Russia over the demarcation of the Afghan boundary caused Lord Granville much solicitude during the closing years of Mr Gladstone's second administration. He retired with his chief in 1885, but returned once more to office as Colonial Secretary in 1886, resigning again with his colleagues in August of the latter year. A steady supporter of Mr Gladstone's Home-rule policy, he died 31st March 1891.

Grape. See VINE.

Grape-hyacinth (*Muscári*), a genus of bulbous-rooted plants, of the natural order Liliaceæ, nearly allied to the hyacinths, but differing in the globose or subcylindrical perianth, contracted at the mouth, and 6-toothed. The species are natives chiefly of the countries near the Mediterranean, and the warmer temperate parts of Asia. Most of them are now frequent in our flower-borders. *M. moschatum* has a smell of musk. *M. racemosum*, popularly named Starch Hyacinth, is a somewhat doubtful native of the south-eastern counties—having, it is believed, escaped from gardens—of England. The flowers of the grape-hyacinths are mostly normally blue, but there are pure white varieties of some species.

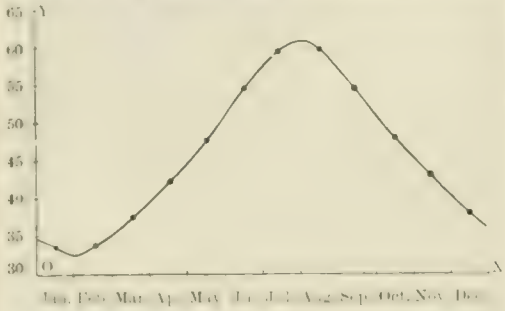
Grape-shot, called also *tier-shot*, consists of small iron balls piled round an iron pin, holding together a series of parallel iron plates of the same diameter as the gun from which they are to be fired, between which are the shot, kept in their places by holes in the plates. On being discharged they spread over a wide area. In another pattern called *quilted* grape the shot are held together on the central pin by canvas instead of iron plates. Both have now almost ceased to be used, their place being taken by *case-shot*, sometimes called *canister*.

Grape-shot.

Grape-sugar. See SUGAR.

Graphic Methods. Under Composition and Resolution of Forces it has been noticed that the point of application, the direction, and the intensity of any force may be represented by the end, direction, and length of a straight line. Similarly, any other physical quantity, such as temperature, atmospheric pressure, or barometric height, electric potential, &c., may be represented by straight lines. Such modes of showing the value of a quantity are called graphic methods; they are largely employed in physical investigations as aids to calculation, and for the purpose of exhibiting the nature of the law according to which some phenomena vary. The principal use of this method is to show the mutual variations of two quantities. This we will illustrate by a particular example.

Suppose a table is drawn up, in one column of which are the months of the year, and in the other the corresponding average temperatures of the air, at some particular place, during these months (the average temperature for each month being the mean of the daily temperatures). Let two lines, OX and OY, be drawn from O, one horizontally, the other vertically; let the successive months of the year be represented on any convenient scale along OX, and let temperature be measured along OY, also on a convenient scale. Corresponding to each month in the year there will be a length along OX, and to each temperature there will correspond a point on OY. At the middle point corresponding to each month draw perpendicular to OX a line representing the temperature on the scale of OY. A series of lines will thus be obtained,



through the upper ends of which there may be drawn, freehand, a smooth curve. The points on the curve in the figure represent the upper ends of these lines. A general glance at such a curve will reveal certain features regarding the temperature of the whole year; at what dates maxima and minima occurred; when the temperature rose or fell quickest, and so on. Such a curve, representing the gradual change of daily temperature, may be produced automatically by photographic representation: a sheet of sensitised paper passes uniformly, by means of clockwork, behind the thermometer stem, in front of which is placed a source of light; the paper above the mercury column is blackened, that below being left unaffected; the curve separating the black and white portions represents the temperature at different times. The same principle is used in the thermograph, barograph, and tide-gauge recording machine.

Instead of time and temperature any other two variable quantities may be taken. When the curve obtained by such graphical methods has some regular geometrical features the mathematical law of the phenomenon may be found; and many qualitative and quantitative results in physics are obtained in this way. It must be remembered that such graphical representations do no more than embody the results of observation or experiment, and cannot be made more accurate than the data themselves.

The graphic method is so largely employed in physical science, and also in statistics, that only a few instances of its application may be given. Watt's Indicator Diagram shows the amount of work done in a complete (double) stroke of the piston; it acts on the principle that the force applied multiplied by the distance through which it acts is a measure of the work done. Pressure and volume are therefore the variables here involved. The temperature of a body at different times may be given by a curve, from which may be found the rate of cooling; a curve may also represent the temperature at different points of a body, and from it may be deduced, if its thermal conductivity be known, the flux of heat across any section of it. The thermo-electric diagram (see Tait's *Heat*) is also a valuable application of the method. Andrew's diagram of the volume of carbonic acid gas under varying pressure may be mentioned as another (see Andrew's *Collected Scientific Papers*, Lond., Macmillan, 1889). The method has also many applications in electricity—e.g. the 'arrival' curve in a submarine cable; and in sound, where acoustic vibrations, beats, and harmonics may be graphically represented.

Graphic Statics. When forces simultaneously act on a particle which remains at rest they are in equilibrium, and, if there be three of them, lines drawn so as to represent the respective forces in magnitude and direction may be so arranged as together to form the well-known Triangle of Forces. Problems in which trigonometrical methods of finding the magnitude and direction of the third side of such a triangle (the resultant) are applied, when those of the other two (the components) are known, or of resolving any given force in any given direction into two 'components' in any two assigned directions, are of common occurrence in text-books. For practical purposes, however, it is very useful actually to draw to scale the triangle of forces appropriate to the data of any particular case; two sides being thus drawn to scale, the third side can be laid down by simply joining two points, and then the line so drawn can be measured with respect to its length and its direction. Similarly the resultant of a number of simultaneous forces can be usefully ascertained by drawing the corresponding Polygon of Forces, and ascertaining the lie and the length of the missing side. The utility of this graphic method is, however, most fully seen in the recent extensions of this method to engineering work. The subject of Graphic Statics is a large one, and we can do little more here than refer the reader to Cotterill's *Applied Mechanics*, which gives, incidentally, full references to the literature of the subject; but in order to give an idea of the nature of the method one illustration may here be supplied. Suppose a bridge-girder (weightless) made up of two N girders in ten divisions (fig. 1), the diagonals being all so arranged as to be in tension; it is 100 feet long, and a load of 100 tons is distributed over it so as to rest uniformly upon the lower booms. Find the stress in each bar. First draw the girder to scale, and mark the bars as in fig. 2: The lower boom of each division may, so far as the

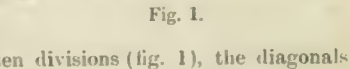


Fig. 1.

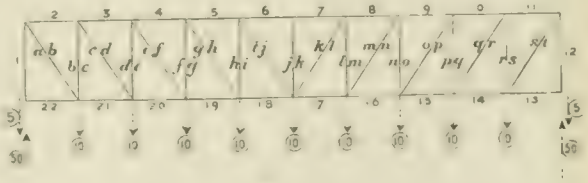


Fig. 2.

girder at large is concerned, be considered as having its proportion of the uniform load (10 tons) arranged in 5-ton loads at its two ends; hence at the angle between 1 and 22, and also at 12–13, there are imaginary loads of 5 tons; at *bc*, *de*, *fg*, &c., imagine 10-ton loads. The supporting piers each exert an upward pressure of 50 tons. There is equilibrium, and this equilibrium may be traced out

at every angle of the structure. At the angles 1–22 and 12–13 the upward pressure of the piers is partly neutralised by the local weight of 5 tons; the vertical bars 1 and 12 have each an upward thrust of 45 tons, which carries the girder; but at these angles there are no horizontal components

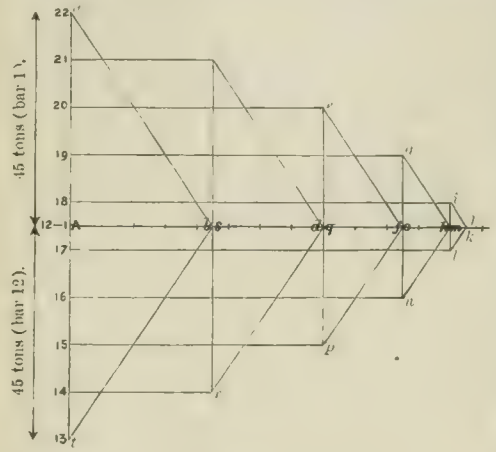


Fig. 3.

along 22 and 13, which, therefore, have no thrust along them, and are neither compressed nor in tension. If a vertical line *a t* (fig. 3) be drawn, each division in which represents 10 tons, the distribution of load may be set out by taking a starting-point, A: then there is in the girder, from 1 round to 12, no load introduced; between 12 and 13 there is introduced what is equivalent to an upward force of 45 tons in bar 12, and the representation of this is

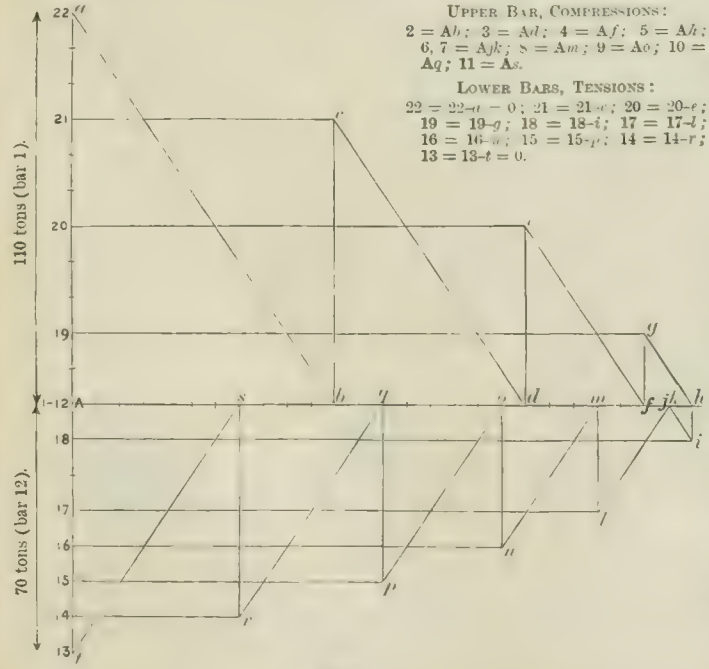

Upper Bar, Compressions:
2 = Ab; 3 = Ad; 4 = Af; 5 = Ah; 6, 7 = Ajk; 8 = Am; 9 = Ao; 10 = Aq; 11 = As.
Lower Bars, Tensions:
22 = 22–a = 0; 21 = 21–c; 20 = 20–e; 19 = 19–g; 18 = 18–i; 17 = 17–l; 16 = 16–n; 15 = 15–p; 14 = 14–r; 13 = 13–t = 0.
110 tons (bar 1).
70 tons (bar 12).

Fig. 4.

prepared for by setting off 4½ divisions *downwards*: then between 13 and 14 there is a downward load of 10 tons, and the diagram sets off one division upwards, to 14; so for each of the junctions as far as 21–22, and then at 22–1 there is an upward 45 tons in bar 1, the setting-off for which brings us back to A. At the junction 1–2 we have three bars in equilibrium; these are 1, 2, and *ab*; the stress in 1 is 45 tons; drawing a triangle, A*ab* (fig. 3), in which the sides are parallel to 1, 2, and *ab*, we find the relative compressions in 1 and 2, and tension in *ab*. At the next junction, *ab–bc* (fig. 2), we have four balanced forces, the tensions in 21 and *ab*, compression in *bc*, and a load of 10 tons. From the extremities of *ab* (fig. 3) draw 22–21 representing the 10-ton load acting downwards, and *bc* a line parallel to *bc* in fig. 2; join 21 and the line *bc* by a line parallel to the rod 21, the tension in which is now represented by the line 21–*c*, while *bc* (fig. 3) represents the compression in *bc* (fig. 2). Next consider the junction 2–3; four bars, 2, *bc*, *cd*, and 3; 2 we know (= A*b*, fig. 3), and also *bc*; we draw a line *cd*, and a line parallel to 3 which, in order to complete the polygon, can only start from A; A*d* and *cd* represent compression and tension in 3 and *cd* respectively. At the next junction, 21–20, we have 21 (= 21–*c*), *cd* (= *cd*), *de* (unknown), 20 (unknown), and a 10-ton load; the polygon is completed by 20*e* and *de* drawn from the ends of the broken line *dc* 21–20. Step by step, by mere drawing of intersecting lines, and by a process which, once the foundation has been laid by setting out the distribution of loads, is far more expeditious and simple than the explanation of it can at first enable it to appear, fig. 3, the measurable diagram of the girder-bar stresses, is evolved, and it is seen that as we near the centre the tensions on the diagonals diminish, that the vertical bar *jk* is neither under compression nor tension, and that the bars 6 and 7 are under the maximum compression (= A–*jk*), and the bars 18 and 17 under the maximum tension (18–*i*, 17–*l*). It will be seen that the diagram is symmetrical; but, if we take the case of a non-uniformly distributed load, the diagram becomes unsymmetrical. Suppose another 100 tons to be laid uniformly upon the lower booms of the left-hand half of the girder: now the piers respectively support 125 and 75 tons; the stresses in bars 1 and 12 are 110 and 70 tons; the diagram, built up on the same principles as in the preceding case, and drawn to a scale reduced to three-fourths, takes the form shown in fig. 4.

See R. H. Smith, *Graphics: or the Art of Calculation by Drawing Lines* (1889).

Graphis (Gr. *graphō*, 'I write'), a genus of lichens, which gives its name to a tribe, Graphideæ, remarkable for the resemblance which the fructification (*apothecia*, or *shields*) assumes to the forms of the letters of oriental alphabets. *G. scripta* is common in northern Europe, but of the twenty species the great majority are tropical. Some are said to assist in the identification of cinchona barks of particular species, growing on certain kinds and not on others.

Graphite. See Black Lead.

Graphophone. See Phonograph.

Graphotype was one of the many processes intended to supersede wood-engraving. The design was sketched with silicate on a prepared chalk

surface, and the chalk brushed away from between the lines. From the chalk an electrotype could be taken. It had a temporary partial success, but has been in turn completely superseded by the zincotype and other processes. See ILLUSTRATION.

Grapple-plant (*Uncaria procumbens*), a procumbent plant of the same genus with the Gambir (q.v.), a native of South Africa. The seed-vessel has many hooked thorns, and clings most tenaciously to any animal—a provision for the distribution of the seed. When it lays hold of the mouth of an ox, Livingstone says, the animal stands and roars with pain and a sense of helplessness.

Graptolites, a group of fossil hydrozoa, apparently related to the recent Sertularia. They had simple or branched polyparies, formed of a chitinous substance, and the polyparies were usually strengthened by a horny-like rod, which is called the 'solid axis.' Professor Nicholson thinks that the term 'solid' is probably a misnomer, and that the axis was most likely hollow and filled with living material. The cellules in which the polypites lived were arranged in a single series on one side of the axis, or in a double series on both sides; the axis was generally prolonged beyond the cells at the growing end of the polypary. Reproductive buds, or ovarian vesicles, have been observed attached to the polypary, exhibiting a method of reproduction similar to that in the hydrozoa, but they differ from the ovarian vesicles of the modern Sertularians in becoming detached from the parent colony. The graptolites appear to have been free-floating organisms. They are generally divided into Monoprionidian and Diprionidian groups. In the first named the polypary, whether single or branched, had only one row of cellules, or 'hydrothecæ;' in the second the polypary was furnished with a row of cellules on each side. The former group ranges from the base to the top of the Silurian system, while the latter is confined chiefly to the Lower Silurian. To this system the graptolites may be said to be confined. Numerous species have been described, and from their abundance in the argillaceous shales and greywackes it is obvious that they must have swarmed in the Silurian seas. There are several other Sertularian-like fossils often described as graptolites; such as *Dendrograptus*—a rooted plant-like form (Cambrian and Lower Silurian); *Dictyonema*, also plant-like, and probably rooted (Silurian); *Retiolites*, with no solid axis (Silurian), but otherwise resembling the graptolites.

Graslitz, a town of Bohemia, on the border of Saxony, 142 m. WNW. of Prague by rail. Musical instruments are manufactured. Pop. 9780.

Grasmere, a Westmorland village, 4 miles NW. of Ambleside. There are four hotels. Pop. 684. Its antique church is the church of the *Excursion;* and in the churchyard, washed by the Rothay, are the graves of Wordsworth and Hartley Coleridge. 'Grasmere's peaceful lake,' with its 'one green island,' lies ½ mile to the south, between Loughrigg Fell (1101 feet) and Helm Crag (1299). Measuring 1¼ by ½ mile, it is 208 feet above sea-level, and 130 feet deep.

Grass-cloth. This name is sometimes given by travellers and missionaries to different kinds of coarse cloth, made by various savage races, the fibre of which is rarely that of a grass. Cloth is, or at least has been, made from Bamboo (q.v.), and a coarse matting is made from Esparto (q.v.), both of which are true grasses. A fine cloth is woven from the fibre of a species of Bœhmeria (q.v.), popularly called China-grass, but the plant is really a nettle.—To the nettle order also belongs the so-called Queensland Grass-cloth plant (*Pipturus argenteus*), which yields a fine, strong fibre.

Grasse, a town in the French department of Alpes-Maritimes, is situated on the southern slope of the Basses-Alpes, 1066 feet above sea-level, and 12 miles N. of Cannes by rail. An ancient place, the seat of a bishopric from 1244 to 1801, it has steep, narrow, crooked streets, a cathedral, and an interesting hôtel-de-ville. Grasse is second only to Paris in its manufactures of essences and perfumes, made from the roses, orange-flowers, heliotropes, mint, &c., which, thanks to the mildness of the climate, are most successfully grown in the neighbourhood. It has also manufactures of olive oil, silk, &c., and is growing in favour as a winter resort. Pop. 9786.

Grasses form the order Gramineæ, which with Cyperaceæ (Sedges) makes up the second great division (Glumaceæ) of Monocotyledons (q.v.). The first division (Petaloideæ) consists of orders whose flowers are of the liliaceous or orchidaceous type; while the flowers of Glumaceæ are best described as 'grassy.' The following characters are sufficient to distinguish grasses from sedges: grasses have generally cylindric or compressed jointed stems, usually with internodes becoming hollow; leaves alternate with sheath clasping the stem, but edges of sheath not joined; embryo at one side of the base of the endosperm (albumen). Sedges have generally triangular, sometimes cylindric, stems, jointed but solid; leaves in three vertical rows with leaf-sheath entire and forming a hollow cylinder round the stem; embryo within the base of the endosperm. The term 'grass' is often applied to any herbaceous plant that helps to form pasture, and agriculturists speak of natural and artificial grasses, the former only belonging to Gramineæ. Cereals (q.v.) and some pasture grasses are annual, but most pasture and woody grasses are perennial. Cereals and pasture grasses are herbaceous; bamboos are woody and may grow to a height of 100 feet in one season. There are 250 genera of grasses, and 3200 distinct species; of these 41 genera with more than 100 species are natives of the British Isles, and fully 800 species and varieties within the limits of the United States.

Description. The *leaves* are long and tapering, one being given off at each node of the stem; the leaf-sheath is a modified stalk, and is often prolonged upwards for a short distance beyond its junction with the blade, into a membrane or ring of hairs (ligule), which forms a collar round the stem. The parallel veins of the leaves are continued downwards into the stem and anastomose only at the nodes. The *stem* (culm) at first consists of solid nodes and internodes, but the internodes, except in sugar-cane and a few other tropical grasses, become hollowed out, and thus the

Fig. 1.

A, spikelet of wheat: *a*, glumes; *b*, awn of outer bract; *c*, barren terminal flower; *d*, stamen. B, vertical section of same spikelet: *e*, ovary; *f*, stigma; *g*, inner bract. C shows position of lodicules (*l*, *l*) in relation to the ovary.

stem is rendered comparatively lighter, and at the same time better able to resist the lateral pressure of the wind; because a cylinder offers more resistance to pressure than does a solid rod of the same

weight and kind of material. The stems of grasses are further strengthened by impregnation with silica. Annual grasses have tufted, fibrous *roots*, but most grasses perennate by means of solid underground stems (rhizomes), from the nodes of which roots are developed; roots also grow freely from the lower nodes of the aerial stems of all grasses. The *flowers* are mostly hermaphrodite, as in barley and oats; maize and a few others are monœcious; and some of the fescue tribe have the lower hermaphrodite and the upper male. Each flower is enclosed by two bracts (paleæ), which are the homologues of the two spathe-like bracts in the Inflorescences (q.v.) of Iridaceæ. The posterior bract is two-nerved, indicating its two-fold nature, and often clasps the fruit when mature; the anterior ('flowering glume') surrounds both, and sometimes bears an Awn (q.v.), as in barley. A number of flowers may be crowded together to form a spikelet; and, further, a number of such spikelets may be attached by stalks to a central axis, forming a raceme, as in *Melica nutans* (fig. 2); when the raceme is loosely branched, the inflorescence becomes a panicle, as in Oats (q.v.); or the spikelets may be sessile on a central axis, forming a compound spike, as in ryegrass (Lolium). The spike may be looked on as a reduced raceme or panicle, in which the stalks of the spikelets have not been developed; each spikelet may again be reduced to a single flower, and then a simple spike like that of mat-grass (*Nardus stricta*) is the result. Beneath the lowest flowers of many spikelets there are two bracts (glumes) which may or may not bear barren flowers in their axils. There is no perianth such as is found in most insect-pollinated flowers. Grass flowers are wind-pollinated and generally inconspicuous; in some, however, there are two or rarely three scales (lodicules) within the flower bracts; and these, from their position and relation to the other parts of the flower, may be regarded as segments of a rudimentary perianth. These scales, becoming turgid at the period of sexual maturity, press the anterior bract outwards, and expose stigmas and stamens for pollination. Should wet weather occur when this stage is reached the powdery pollen may become clogged and kept from being blown about; thus preventing fertilisation and the opportunity of producing seed.

Fig. 2.

A, *Melica nutans*; inflorescence a raceme of spikelets. B, *Lolium perenne*; a compound spike. C, *Nardus stricta*; spikelets reduced to one flower each.

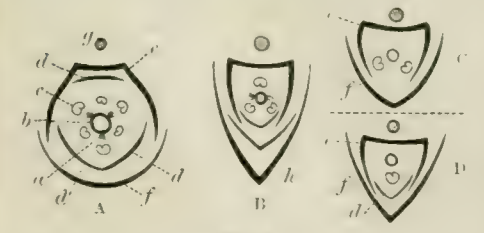


Fig. 3.

A, floral diagram of Bambusa (for explanation, see article Flower): *a*, stigma; *b*, ovary; *c*, stamen; *d*, lodicule; *e*, inner bract; *f*, outer bract; *g*, stem. B, Avena: *h*, glume; stamens reduced to three. C, Coleanthus: lodicules awanting; two stamens. D, Monandraura: one stamen.

Stamens vary from six or more to one; in British grasses usually three, but three to one in the fescue tribe. The slender filaments are inserted at the bases of the anthers, but the anther lobes grow downwards below the point of insertion, and the anthers appear to be, but are not, versatile. The *ovary* is one-celled; there are three or two styles, with long and hairy, or short and feathery stigmas, which are thus enabled to catch the wind-borne pollen. The fruit is one-seeded (*caryopsis*); the *seed* is adherent to the pericarp. The *embryo* by the great development of the farinaceous endosperm is displaced to one side at the base of the latter, its surface of contact being confined to that of a large process of disputed homology, the scutellum. When a grain of wheat or other grass begins to germinate, the scutellum acts as a placental surface to the embryo, digesting the substance of the endosperm, and passing it on in a soluble state to the embryo, which soon begins to develop roots and leaves. When all the endosperm has been used up the seedling grass has put forth roots enough to draw a sufficient supply of sap from the soil, and green leaves to transform the sap into food materials for the tissues of the plant. The scutella of grains may be compared to the suckers (haustoria) of mistletoe, for it is by means of suckers that plant parasites fix upon, and draw sap from, their hosts.

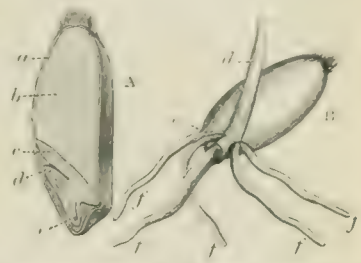


Fig. 4.

A, grain of wheat in vertical section: *a*, pericarp; *b*, endosperm; *c*, scutellum; *d*, young stem and leaves (plumule); *e*, first root (radicle). B, grain of wheat after germination has begun: *f*, secondary roots.

Classification.—The order is divided into two divisions, the divisions into tribes, genera, and species. The genera are omitted here, and only the better-known species are given as examples.

(*a*) *Paniceæ.*—Spikelets articulate with the pedicels below the lowest glume, with a single terminal fertile flower, while the lower inferior is male or sterile.

Tribe	Examples.
Paniceæ	Panicum; Setaria.
Maydeæ	Job's Tears (Coix); Maize (Zea).
Oryzeæ	Rice (Oryza); Cut Grass (Leersia).
Tristegineæ	Arundinella.
Zoysieæ	Tragus.
Andropogoneæ	Sugar-cane (Saccharum); Durra (Andropogon); Millet (Sorghum).

(*b*) *Poaceæ.*—Spikelets usually articulated above the lowest glume, 1- or many flowered; male or imperfect flower above the fertile ones.

Tribe	Examples.
Phalarideæ	Reed Canary Grass (Phalaris); Sweet Vernal Grass (Anthoxanthum); Fox-tail Grass (Alopecurus).
Agrostideæ	Millet Grass (Milium); Timothy Grass (Phleum); Bent (Agrostis).
Aveneæ	Hair Grass (Aira); Soft Grass (Holcus); Oats (Avena).
Chlorideæ	Dog's-tooth Grass (Cynodon); Eleusine.
Festuceæ	Reed (Phragmites); Dog's-tail Grass (Cynosurus); Cock's-foot Grass (Dactylis); Melic Grass (Melica); Quaking Grass (Briza); Poa; Fescue; Brome.
Hordeæ	Rye (Secale); Ryegrass (Lolium); Wheat (Triticum); Barley (Hordeum); Mat Grass (Nardus).
Bambuseæ	Bambusa; Arundinaria.

Distribution.—Grasses are almost universally distributed on land, and are found at all elevations up to the snow line, wherever there is soil. In temperate climates they form natural pastures, but in warm regions they are more tufted, and, like the sugar-cane and many bamboos, often attain a great height. The species of a single genus have often widely different habitats—e.g. *Poa annua* is a low growing field grass, while a closely allied species, *P. aquatica*, forms tall reed-like growths by the margins of rivers and lakes. The distribution of grasses in time dates from the Upper Eocene (q.v.) and subsequent formations.

Uses. The seeds of cereals furnish the principal material for *Bread* (q.v.) in most countries. By the process of malting, the starch of grains is converted into sugar, which is then allowed to undergo alcoholic fermentation; *Beer* or *Ale* (q.v.) is made in this way from barley, and from this liquor *Whisky* (q.v.) is obtained by distillation. *Sugar* is also obtained directly from the juices of some grasses, e.g. Sugar grass (*Sorghum saccharatum*), unripe maize, and Sugar-cane (q.v.). *Rum* is the fermented and distilled liquor produced from the sugar of sugar-cane. Some grasses form Pasture (q.v.) and Fodder (q.v.). A few are *medicinal*, as Job's Tears (*Coix lachryma*) (q.v.); the reeds, *Phragmites communis*, *Calamagrostis*, and *Arundo Donax*; and Couch grass (*Triticum repens*), the rhizomes of which form a mild diuretic. Very few have poisonous properties. Darnel (q.v.) is held by some to be poisonous. Coldstream (*Grasses of N. Punjab*) says: 'There is a curious fact regarding the qualities of *Sorghum vulgare* as food for cattle—viz. that in a dry season, before it flowers, the plant is poisonous to cattle. This poisonous quality is also shared by its congener, *S. halepense*.' Some grasses are *fragrant*: Sweet Vernal Grass (*Anthoxanthum odoratum*) contains coumarine, a crystalline aromatic substance which gives the sweet scent to meadow hay. Some East Indian grasses are even more strongly scented, as Lemon-grass (*Andropogon citratum*) and others of the same genus, which yield grass-oil. The woody stems of bamboos and other large grasses are applied to a great variety of economical purposes; and the straw of many of the smaller grasses is used for thatching, rope-making, plaiting, &c. (see STRAW-MANUFACTURES). Thus the fibres of the Moonja (*Saccharum Munja*) of India, the Esparto (q.v.) of Spain, and a few others are made into ropes, mats, sacks, and other coarse fabrics. *Paper* is made in China from the young shoots of bamboo; and in most civilised countries from the straw of esparto, rye, wheat, barley, and oats. All grasses, by means of their roots, help to fix the soil, and prevent it being washed away by rain and floods.

See Parnell's 'British Grasses,' and 'Gramineæ' in Engler's *Pflanzenfamilien*. For classification, see also Bentham and Hooker's *Genera Plantarum*. The U.S. Department of Agriculture has published several valuable bulletins and monographs on American grasses, by Dr George Vasey.

Grasshopper, a name given to numerous insects forming the family Locustidæ, included in the order Orthoptera, and nearly related to Crickets (Gryllidæ) and Locusts (Acrididæ). It is unfortunately confusing that 'locusts' are not included in the family Locustidæ, and that one of our commonest grasshoppers is *Locusta viridissima*. It must be noted that in this article 'grasshoppers' mean the majority of Locustidæ. Whether grasshoppers are herbivorous or, as is oftener the case, carnivorous, they usually live among vegetation, in woods and thickets or in the open field, keeping quiet during the day, but making the woodsides merry with their love 'songs' in the summer evenings. Most of them feed on flies and caterpillars, in catching which they use their powerful fore-legs, but many affect plants, and some combine both diets. During their courting season they may be seen flying even in the afternoon, but they are predominantly nocturnal and twilight insects. By their frequent green colour and yet subtler mimetic characters they are in many cases well concealed in their leafy haunts. The family is large and world-wide in distribution, but best represented in tropical and temperate regions.

In the grasshopper family (Locustidæ) the head is placed vertically; the slender antennæ are longer than the body; there are hemispherical eyes, but rarely eye-spots; wings and wing-covers are generally present. The right (and occasionally also the left) wing-cover of the male bears posteriorly

Grasshopper, Female (*Locusta viridissima*).

a clear, round membrane stretched on a ring, which produces the well-known 'chirp' when set in vibration by the action of a serrated ridge on the under side of the opposite wing-cover. The left wing-cover is the bow, the right is the fiddle of the male grasshopper's music. There is usually a well-developed auditory organ at the base of the anterior legs. The females have a long ovipositor.

Sexually mature grasshoppers appear in late summer and autumn. The eggs are laid by means of the ovipositor either in the earth or in some dry stem. From these in spring larvæ are developed, which are virtually like the adults, but moult at least six times before they become full-grown.

The Great Green Grasshopper (*Locusta viridissima*), common in Europe, and occurring in Britain, has a body over an inch long. Equally large is *Decticus verrucivorus*, also British, which owes its specific title to the habit Swedish peasants have of making it bite their warts, which the secretion of a fluid from the mouth of the insect is said to affect favourably. Very common in Europe are *Thamnotrizon cinereus*, *Platycleis grisea*, and other species. Among American grasshoppers *Conocephalus ensiger*, type of those with a conical forehead, is very common, as are also various species of Xiphidium and Orchelimum. The nearly allied Katydids (e.g. *Cyrtophyllus concavus* and *Microcentrum retinerris*—will receive separate notice (see KATYDID). The tropical genus Copiophora is noteworthy for the length of its ovipositor, which sometimes attains a length of two inches, while Phyllophora and Phylloptera deserve mention for the exceedingly leaf-like appearance of their wing-covers. See CRICKET, KATYDID, LOCUST.

Grass-moth (*Crambus*), a genus of small moths, allied to the Clothes-moths. The species, which are numerous, inhabit pastures, where they may be often seen to rise in great numbers when disturbed, and soon to settle again on the blades of grass. Their form, when their wings are closed, is long and narrow, pointed at the head, abruptly cut off at the opposite end. They are often brown and white, sometimes silvery and golden.

Grass of Parnassus (*Parnassia*), a genus of plants belonging to the natural order Saxifragaceæ.

The popular and also the botanical names are founded on the myth that the best-known species (*P. palustris*) first appeared on Mount Parnassus, the abode of grace and beauty. The plant is a native of bogs and moist heaths in Britain and throughout northern Europe and Russian Asia, becoming a mountain plant in southern Europe and west central Asia. The calyx is deeply 5-cleft, the petals white, 5 in number, and there are 5 perfect and 5 imperfect stamens, the latter bearing instead of anthers a tuft of 10 to 12 globular-headed hairs. There are several other species natives of Asia and North America.

Grass-oil, a name under which several volatile oils derived from widely different plants are grouped. The grass-oil obtained by distillation from the leaves of *Andropogon waranc̃usa* is used for rheumatism, and has the same stimulant effect as cajeput oil. Ginger-grass Oil is obtained from *A. nardus*, a native of India, and other species of the same genus. Geranium Oil, derived from *Pelargonium radula*, is so like ginger-grass oil in its properties that they are used for the same purposes, and are bought and sold under either name, mainly as an adulterant of Oil of Rose. Turkish Grass-oil is obtained from *A. pachnodes*, indigenous to India, Persia, and Arabia. Lemon-grass Oil, or Citronella Oil, is derived by distillation from *A. schœnanthus*, indigenous to India and cultivated in Ceylon. It has an odour resembling oil of citron, and is largely used for scenting soap. Cyperus-grass Oil is extracted from the tubers of *Cyperus esculentus*, indigenous to southern Europe, and is used both as a table oil and in the manufacture of soap.

Grass-tree (*Xanthorrhœa*), a genus of plants of the natural order Liliaceæ, natives of Australia, and constituting a very peculiar feature in the vegetation of that part of the world. They have shrubby stems, with tufts of long wiry foliage at the summit, a long cylindrical spike of densely aggregated flowers shooting up from the centre of the tuft of leaves. The base of the inner leaves of some species is eatable, and forms, particularly when roasted, an agreeable article of food. It has a balsamic taste; and all the species abound in a resinous juice, which, on exposure to the air, hardens into a reddish-yellow inodorous substance with a shining fracture, soluble in alcohol, and useful as a tonic in dysentery, diarrhœa, and other intestinal maladies; used also by the natives of Australia for uniting the edges of wounds, and with an aluminous earth for caulking their canoes, and as a cement for various purposes.—The Common Grass-tree (*X. hastilis*) has a stem about four feet high, but sometimes a foot in diameter. It is of very slow growth, and is supposed to be many centuries old when it has reached such dimensions.—Several species are found in eastern Australia and also in New Zealand, where their leaves are used as fodder for all kinds of cattle.

Grassum, in the law of Scotland, is a lump sum paid by persons who take a lease of landed property. 'Rent,' says Bell, 'is naturally periodical, but sometimes part is paid in anticipation in grassum. And so grassum is, when analysed, a proportion taken from each year's rent, and paid at once by anticipation, either to supply some necessity for ready money, or to disappoint some future possessor of the estate.' In England the words 'premium' in some cases, and 'fine' in others, mean the same thing.

Grasswrack (*Zostéra*), a genus of plants of the natural order Naiades, one of the few genera of phanerogamous plants which grow amongst seaweeds at the bottom of the sea. The leaves are narrow and grass-like, and the flowers consist merely of stamens and pistils, without any perianth, inserted on the central nerve of one side of a flat thin linear *spadix*, with a leafy *spathe*. The pollen is confervoid.—The Common Grasswrack (*Z. marina*) is a perennial plant, which forms green meadows on the sandy bottom of shallow parts of almost all the European seas, and abounds in creeks and salt-water ditches. It is found in great plenty on the British shores. It becomes white by exposure to the air. The rush-like coverings of Italian liquor-flasks are made of it: it is much used for packing glass bottles; and it serves well for thatch. Cattle eat it as forage; it is burned to obtain soda, and has been employed in the manufacture of paper. It has been long used in Holland, Iceland, and elsewhere for stuffing pillows and mattresses; and this use has of late years very much extended, so that the plant has become an article of commerce, under the name of *Alga marina*, or more commonly, but incorrectly, *Alva marina* (Ger. *See-gras*).

Grate. See WARMING.

Gratian, a Benedictine monk, who at Bologna between 1139 and 1142 compiled the *Decretum Gratiani*. See CANON LAW.

Gratianus, AUGUSTUS, Roman emperor from 375 to 383, was the eldest son of Valentinian I., and was born at Sirmium in Pannonia in 359. At nine he was elevated by his father to the rank of *Augustus* at Ambiani, or Amiens, in Gaul, and next year accompanied him in his expedition against the Alemanni, in order to learn the art of war. On the death of Valentinian the troops elevated Gratian to the throne, giving him at the same time as a colleague his half-brother Valentinian II. Gaul, Spain, and Britain fell formally to Gratian's share, but as his brother was only four years old he virtually ruled also over the rest of the western empire, fixing his residence at Treviri (*Trèves*). At first he showed vigour in repelling the incursions of the turbulent barbarians, and suddenly found himself in 378, on the defeat and death at Adrianople of his uncle Valens at the hands of the Goths, sovereign also of the eastern empire. Finding himself inadequate for the task of ruling the whole empire, he recalled Theodosius from Spain, and appointed him his colleague on the 19th January 379. Gratian possessed some admirable virtues: he was pious, chaste, temperate, and eloquent; but his character was too pliant, and he was often led to commit gross acts of cruelty and tyranny. His persecution of the pagans, and afterwards of heretic Christians, made him a great favourite with orthodox ecclesiastics, but rather alienated the affections of his subjects generally; while his fondness for frivolous amusements and unworthy associates excited the contempt of the army, so that when Maximus was proclaimed emperor by the legions in Britain crowds of the disaffected flocked to his standard. Gratian was defeated by him near Paris, and fled to Lyons, where he was put to death 25th August 383.

Grati'ola, a genus of plants of the order Scrophularineæ. *G. officinalis*, or Hedge Hyssop, found in most parts of Europe, is extremely bitter, a violent purgative, diuretic, and emetic, and in overdoses an acrid poison; but as a medicine was formerly called *Gratia Dei* ('Grace of God').

Gratry, ALPHONSE, Catholic theologian, born 30th March 1805 at Lille, became General-vicar at Orleans, professor at the Sorbonne, and member of the Académie. He wrote a *Cours de Philosophie*, a work on the creed, a commentary on Matthew, and *La Morale et la Loi de l'Histoire* (1868). He confuted the policy of the Vatican Council, but submitted himself, and died 25th November 1871, leaving *Souvenirs de ma Jeunesse*.

Grattan, HENRY, one of the greatest of Irish patriots and orators, and, like Curran, Flood, Isaac Butt, and Parnell, a Protestant, was born in Dublin, July 3, 1746. His father was recorder of the city, and one of its members from 1761 till his death in 1766; his mother was daughter of Thomas Marlay, Chief-justice of Ireland, one of whose sons lived to become Bishop of Waterford. At seventeen he entered Trinity College, Dublin, and here gave himself with remarkable eagerness to the study of classics. Already Henry Flood had been forming a regular party of opposition in the Irish House of Commons, and young Grattan embraced his reforming principles with such impolitic ardour that his irate father disinherited him from such property as he could alienate. At twenty one he entered the Middle Temple, London, and read law in a desultory fashion, nourishing his peculiar ambition the while by listening to the debates in the House of Commons and by constantly declaiming in set terms to imaginary audiences in the privacy of his chamber. In 1772 he was called to the Irish bar, and three years later, through the influence of the genial and enlightened Earl of Charlemont and by the advice of Flood, entered the Irish parliament as member for the borough of Charlemont. It was but two months before that Flood had thrown away his popularity by accepting office under government, and the young orator leaped at one bound into his place. He found the nation fast drifting to bankruptcy and ruin from the loss of market that followed the war with America, and the odious restrictions upon Irish trade that had come down from the days of William III.; and he at once flung himself with all the vehemence of his nature into the cause of retrenchment and reform.

Meantime, in the dread of French invasion, the volunteer movement spread from Belfast over Ireland, and ere long the attitude of the people in their demand for free export became so formidable that Lord North, whose own inclinations had formerly been thwarted by the interested opposition of the English manufacturers, granted in 1779 a total repeal of all the restriction acts. This gained, Grattan plunged into a greater struggle for nothing less than legislative independence. On the 19th April 1780 he made perhaps his greatest speech, concluding with a memorable series of resolutions to the effect that while the crown of Ireland was inseparably annexed to that of England, the king with the consent of the parliament of Ireland was alone competent to enact laws to bind Ireland. After fifteen hours the debate was adjourned indefinitely, but all men felt that Grattan had gained a great moral victory. The popular demands were formulated at the Convention of Dungannon (February 15, 1782), and asserted by Grattan in a famous speech (April 16), which began with the words, 'I am now to address a free people.' A month later the Rockingham ministry, which numbered among its members Grattan's friend Fox, surrendered apparently unconditionally, and the Irish parliament in gratitude voted Grattan a reward of £50,000. Unfortunately the question was soon raised whether the mere repeal of the Declaratory Act (6 Geo. I. chap. 5) was sufficient as a renunciation of the principle of England's right to legislate for Ireland. Grattan wished his countrymen to trust to the generous instincts of English honour, and accept the gift without factious wrangling about the manner of its giving, but Flood put himself at the head of the malcontents, demanding 'simple repeal' and renunciation rather than concessions granted merely to the exigency of the moment. He carried the mass of his countrymen with him, and what was perhaps the historic moment for the reconciliation of England and Ireland was lost. The quarrel between the two leaders culminated in one dramatic scene on the floor of the house, when Grattan overpowered his antagonist with a tornado of rhetoric that has perhaps never been surpassed for the ruthless energy of its invective.

The history of 'Grattan's parliament,' as it has deservedly been called, did not correspond to the patriotic dreams of its great founder. It was impossible for a parliament so little really representative and so much subject to corruption and undue influences from without to rise into the region of real statesmanship. In his ideas about the rights of his Catholic fellow-countrymen Grattan was far more advanced than most of his own followers. Apart altogether from the fact that the Roman Catholics, comprising two-thirds of the whole population, were entirely without representation; out of a house of 300 members no fewer than two-thirds were nominated by but a hundred patrons. The urgent need of parliamentary reform and the remedy of domestic abuses soon occupied the minds of all Irish patriots, the high-minded and the self-seeking alike. Once more at Dungannon there assembled on September 8, 1783, as many as 500 delegates to formulate the demands for parliamentary reform, which were presented to the house by Flood and rejected, while Grattan looked on in a kind of neutrality that was perhaps a consequence of the recent quarrel. He devoted himself to advocating the reform of special abuses, but his Place and Pension Bill, as well as his bills to prevent revenue officers from voting at elections, and offices of state being given to absentees, and for the commutation of ecclesiastical tithes, were in turn rejected.

Meantime continued commercial depression had produced a strong counter-feeling in Ireland for protection, which was yet unable to prevent the Secretary Orde's remedial measure for absolute free trade from being carried. This measure, however, Pitt found himself unable to carry in the English House of Commons, except subject to a number of stipulations, one of which was that all English navigation laws now and hereafter were to be adopted as such by the Irish parliament; and to this Grattan and the Irish patriots found themselves unable to accede, as an outrage upon the freedom of the Irish parliament. Pitt's mortification at this and his displeasure at the independent attitude of the Irish parliament in the regency dispute of 1789 helped to confirm his determination that union was the only effective means of final pacification. Grattan was returned for the city of Dublin in 1790, and by this time he had definitely taken up the cause of Catholic emancipation. The corruption of the Castle government and of a parliament venal beyond all precedent; the persistent repression of the agitation for Catholic relief, changed for a moment into hope at the appointment of Fitzwilliam as Lord-lieutenant, only to be dashed to the ground again by his withdrawal; and the spirit of discontent generated by the French Revolution that was now everywhere in the air had fomented the movement of the United Irishmen, which was to be extinguished in the bloodshed of 1798. Hopeless of his country and broken by ill-health, Grattan retired to his house at Tinnehinch on the eve of the rebellion, but returned to take his seat for Wicklow in the last session of the Irish parliament. Weak as he was he fought the bill for the Union with an heroic courage that would have overcome everything but the gold and the coronets of Pitt, pouring his showers of invective upon the head of Corry the Chancellor of the Exchequer, who retorted with a challenge, and in the duel was wounded in the arm. Once more Grattan retired to private life, from which he emerged in

1805 as member for Malton in Yorkshire, and for Dublin the following year. His first speech in the English House of Commons fully sustained his oratorical reputation. It contained the well-known passage about the Irish parliament: 'Of that assembly I have a parental recollection. I sat by her cradle; I followed her hearse.' The remaining energies of his life were devoted to the cause of Catholic emancipation, which he reiterated was the price of the union, apart altogether from the intrinsic justice of the demand. 'A great majority cannot overcome a great principle. God will guard his own cause against rank majorities. In vain shall men appeal to a church cry, or to a mock thunder; the proprietor of the bolt is on the side of the people.' Instead of one-sided 'securities' he demanded from his opponents adequate reasons for their opposition—'some apology to after ages for inflicting on one-fourth of their fellow-subjects political damnation to all eternity.' Despite all his eloquence and the support of Canning and other statesmen, he was not to see triumph in his lifetime. In December 1819 his health began finally to give way; but as he grew weaker his responsibility to this question weighed the more upon his mind. On the 20th of the following May he crossed from Dublin, a dying man, to speak once more for the cause, and, unable to bear the motion of a carriage, was carried to London from Liverpool by canal. But his voice was never to be heard again. A day or two after his arrival he sank, a prayer for his country on his lips, June 4, 1820. He was buried in Westminster Abbey beside the grave of Fox.

Grattan's figure was small and spare; his face long, thin, and slightly marked by smallpox. His gestures in speaking were violent and eccentric, and his voice of no great volume, yet he wielded his listeners at will by his energy and passion, his overpowering earnestness and enthusiasm. He was a consummate master of epigram, and few orators have had his rapidity and vigour. His description of Flood as standing 'with a metaphor in his mouth and a bribe in his pocket' is but one among a hundred phrases that will never be forgotten. His patriotism was enlightened and incorruptible, and his honour remains without a stain.

The best collection of his *Speeches* is that made by his son, Henry Grattan, M.P. (4 vols. 1822), who also edited in the same year his *Miscellaneous Works*. The standard Life is also that by his son (5 vols. 1839-46), but this is far from being a satisfactory work. See also the sympathetic essay in W. E. H. Lecky's *Leaders of Public Opinion in Ireland* (2d ed. 1872); Dunlop's excellent study in the 'Statesmen' series (1889); and Lecky's *England in the Eighteenth Century*, vols. vii and viii.

Gratuitous Deed, in the law of Scotland, means a deed granted without any value received. Such deeds, if made after the contracting of debt, and in favour of a near relation or confidential friend, are presumed to be fraudulent and so null. In England gratuitous deeds are usually styled Gifts (q.v.).

Gratz, or GRAZ (formerly *Grätz*), the capital of Styria, in Austria, 141 miles SSW. of Vienna by rail, is a picturesque old town with four suburbs, built on both sides of the Mur, and encircled by fine gardens and pleasure-grounds. Of the former fortress, erected on a hill in the centre of the town, and dismantled in 1809 by the French, two towers and other remains still exist. The town itself contains several old buildings, as the Late Gothic cathedral (1462), two other Gothic churches (one built in 1283), the ancient castle of the Styrian dukes, the Landhaus, where the nobles of the duchy held their meetings, the university, originally founded in 1586 (with 1134 students in 1885, and a library containing 120,000 volumes), an armoury, palaces of the Styrian nobles, and four monasteries dating from the 16th and 17th centuries. There are also national archives, a cabinet of coins and antiquities, a technical school (Johanneum), a second library of 70,000 volumes, and a botanic garden. The most important of its many industries are the manufacture of machines, steel goods, rails and railway carriages, sugar, wine, perfumery, stearine candles, soap, &c. Fat capons, biscuits, and chocolate figure prominently as articles of trade. Gratz is a favourite place of residence for Austrian officials retired from service. Pop. (1890) 112,069, including a garrison of 5000 men. The town is mentioned in the annals as early as 881. In 1481 it repulsed the Hungarians from its walls, and in 1532 the Turks. In 1797, and again in 1809, it was occupied by the French. In the vicinity are several hydropathic establishments and holiday resorts. See Ilwof and Peters, *Geschichte und Topographie der Stadt Graz* (1875).

Graubünden. See GRISONS.

Graudenz, an old town in the province of West Prussia, on the Vistula, 37 miles N. of Thorn. It carries on a trade in corn, wool, and cattle, and has iron-foundries, breweries, and tapestry and cigar manufactories. Pop. (1875) 14,553; (1890) 20,385. About a mile north of it on a hill (282 feet) is the fortress of Graudenz, built in 1776, and successfully defended against the French in 1807. It was maintained as a fortress till 1874, and now serves as a barrack and military prison. Pop. 2072.

Grauwacke. See GREYWACKE.

Gravel, the name given to aggregations of water-worn and rounded fragments of rocks, varying in size from a pea to a hen's egg. When the fragments are smaller, the deposit is sand; when larger, it is called shingle. Beds of gravel occur in formations of every age. While the materials have been a long time in being prepared, and have travelled perhaps a great distance from the mother-rock, gravel deposits have been formed speedily and by the action of a strong current of water. They form very irregular and limited deposits, occurring generally as banks or hummocks in strata of sand. Unless in the most recent deposits, they almost always form a hard rock called conglomerate or puddingstone, the pebbles being compacted together by some infiltrated cement, either calcareous, ferruginous, or siliceous in character. Even recent gravels are sometimes formed into a compact concrete, though these and later deposits are generally loose. The stones of a gravel or conglomerate may be fragments of almost any kind of rock; but the harder species are the most common—pebbles of quartz and quartzite forming as a rule the chief material in gravel-beds of all ages. In our own day gravel and shingle are formed both by fluviatile and marine action, and the same was the case in the older periods of the earth's history. Thus certain conglomerates mark out for us the sites of old sea-coasts, while others represent old river-beds.

Gravel varies much in character and appearance according to the formation from which it is derived. In the making of roads and walks, particularly in gardens, pleasure-grounds, and public parks, it is the last ingredient used. Essential qualities in a good gravel are (1) that it should be binding—that is to say, it should not shift like sand under foot; (2) it should be durable; and (3) its colour should be agreeable to the eye and in harmony with vegetation. It is rare to find a gravel in which all these qualities are combined. The only sort known in Britain to possess them all in itself is the famous *Kensington* gravel, which has long been regarded by landscape-gardeners at home and on the Continent as the most perfect natural walk or

road-finishing material obtainable anywhere. It is a pit-gravel, and abounds in oxide of iron, to which it owes its binding quality and also its fine warm harmonious colour. Many other pit-gravels also possess this cohesive property in a high degree, but are defective in colour. As possessing better binding properties, pit-gravels generally are to be preferred to sea or river gravels; but their defects of colour often preclude their use in landscape-gardening. The Kensington gravel is costly and difficult to procure. On this account, and also because of its similarity in colour, the most popular gravel of the present time is the *Dorset Pea*; but it is also one of the most shifting, the flinty pebbles composing it being round and about the size of a pea. As the name implies, this sort comes from the coast of Dorsetshire. From the shore of the neighbouring county, Hampshire, is obtained another pleasingly coloured flint-gravel named the *Lymington*; and the Sussex coast furnishes two sorts named *Sussex Pea* and *Sussex Bean*. The prevailing form of the former is pea-like, that of the latter bean-like; hence their respective names in commerce. They are found commingled on the shore, and are separated by sifting. Shell-gravel —so called because composed of minute shells entire or the fragments of larger ones—is also a favourite gravel, being pleasing in colour and comfortable to walk upon when not laid on very deep. It is found on various parts of the British coasts and on those of the Channel Islands. Musselburgh gravels—both shore and pit—are prized in that district, being good in colour, and the pit variety has also fair binding properties. There are many manufactured gravels, such as granite, whinstone, marble, quartz, slag, glass, &c., which are crushed in machines, and afterwards riddled to the desired sizes. These and all the sea and river gravels are used in making asphalt and other composite roads and paths, some of them when skilfully combined with cement imparting a very beautiful appearance to the surface.

Gravel, a disease. See CALCULUS.

Gravelines, a fortified town in the French department of Nord, is situated in a marshy locality at the mouth of the Aa, 13 miles by rail ENE. of Calais. A desolate-looking place now, with grass-grown streets, it has an historic past, as the scene of Egmont's victory over the French (1558), and the place off which the English dispersed the Armada (1588). It was taken by the French in 1644, retaken by the Austrians after a ten weeks' siege in 1652, and finally recaptured in 1658 by Louis XIV., who had it fortified by Vauban. Pop. (1872) 4391; (1891) 4125.

Gravelotte, a village of Lorraine, 7 miles W. of Metz. There, on 18th August 1870, the French under Bazaine sustained a severe defeat by the Germans. See FRANCE, Vol. IV. p. 783.

Graves. See BARROW, BURIAL, CHURCHYARD, CEMETERY, MONUMENTS.

Graves, ROBERT JAMES, physician, who did much to raise the status of his profession in Ireland, was born in 1797, the youngest son of the Dean of Ardagh. He studied medicine at Dublin, and after taking his degree visited the medical schools of London, Göttingen, Berlin, Copenhagen, those of France and Italy, and Edinburgh, and on his return home settled (1821) in his native city as a private practitioner and a teacher of medicine, especially distinguishing himself by the introduction of improved methods of clinical study. In 1827 he was appointed professor of the Institutes of Medicine in the College of Physicians, Dublin, of which college he was chosen president in 1843 and 1844. He was elected a Fellow of the Royal Society in 1849. Many of his most remarkable papers appeared in the *Dublin Journal of Medical Science*, which was founded by him in 1832. Dr Graves died on 20th March 1853. He published *A System of Clinical Medicine* (1843) and *Clinical Lectures* (1848). After his death his *Studies in Physiology and Medicine* was issued in 1863 by Dr W. Stokes. See *Dublin University Magazine*, 1842.

Gravesend, a port and borough of Kent, on the right bank of the Thames, 24 miles ESE. of London. It consists of the old town, with narrow, irregular streets, and of the handsome new town on the high ground. In the vicinity are extensive market-gardens; and many of the inhabitants are employed in fishing. Gravesend forms the limit of the port of London; and here pilots and custom-house officers are taken on board of vessels going up the river. For centuries the prosperity of the town has depended on its connection with the metropolis. The salubrious air and beautiful scenery at Gravesend render it a favourite watering-place with Londoners. It carries on some shipbuilding, iron-founding, soap-making, and brewing, and a considerable trade in supplying ships' stores. Gravesend was incorporated under Elizabeth, and since 1867 has returned one member to parliament. Pop. (1861) 24,525; (1891) 35,492, of whom 24,067 were within the municipal boundary. Gravesend was originally a *hythe*, or landing-place, and is mentioned as such in Domesday. Around this landing-place a town grew up soon after the Conquest. Here the fleets of early voyagers, as that of Sebastian Cabot in 1553, and of Martin Frobisher in 1576, assembled, and here the lord mayor, aldermen, and city companies of London were wont to receive all strangers of eminence, and to conduct them up the river in state. A great fire in 1850 did damage to the amount of £100,000. See Arden's *History of Gravesend* (1843).

Gravina, a town of southern Italy, in the centre of a rich agricultural district, 33 miles SW. of Bari. Pop. 15,612.

Graving-dock. See DOCK.

Gravitation. It is a matter of common experience that all unsupported bodies near the surface of the earth fall to the ground, the direction of their motion being towards the earth's centre. The modern explanation of this phenomenon is that it is due to an attractive force termed gravitation or gravity, which exists between any such body and the earth, in virtue of which they tend to move towards one another. The motion of the earth and other planets round the sun, and of the various satellites round their primaries, may be explained on the same ground. The mode of action of this force is given in the following generalisation, first explicitly given by Newton, and known as the *Law of Gravitation*: Every particle of matter in the universe attracts every other particle with a force whose direction is that of the straight line joining the two, and whose magnitude is proportional directly as the product of their masses, and inversely as the square of their mutual distance.

Previous to Newton's investigations, Kepler, by a truly prodigious amount of labour, had deduced from the observations of Tycho Brahe the following kinematical laws of planetary motion: (1) The path of each planet is an ellipse, of which the sun occupies one focus; (2) the radius-vector (i.e. the straight line which joins the centre of the sun to that of the planet) of each planet describes equal areas in equal times; (3) the square of the periodic time (i.e. the time during which a planet makes one complete revolution round the sun) of each planet is proportional to the cube of the major axis of its elliptic orbit. From the second of these

deductions Newton showed that if the sun attracts the earth or other planet, the direction of this attractive force must be in the line joining their centres; from the first and third he proved that its intensity must be inversely proportional to the square of their mutual distance (so that at double that distance the intensity of attraction would be one-fourth; at three times the distance, one-ninth; and so on). Lastly, the proof that the attraction is proportional to the product of the masses is found in the fact that the weight of any body is under all circumstances proportional to its mass. To test the truth of his deductions, Newton studied the motion of the moon round the earth, and found that this satellite is retained in its orbit by an attraction which is exactly the same as that which causes a body near the earth's surface to fall with an acceleration of (about) 32·2 feet per second.

It must, however, be remembered that Kepler's laws are themselves only approximately true, owing to the attraction of one planet on another interfering with what might be termed the ideal state of things, and thus producing those small superposed motions of a planet which astronomers have termed *perturbations*. But it is just in this that the confirmatory proofs of the law of gravitation are found; for not only are all these perturbations completely explained by its means, but they have also been discovered and measured by it.

The action of gravitation is independent of the *nature* of matter, thus differing from magnetic attraction, which is only found in a restricted class of bodies. At the same time the manner in which magnetic and also electric attraction depends upon distance is the same as gravitation. Gravitation is not affected by the presence of other matter; in other words, the weight of a body is the sum of the weights of its parts.

The intensity of gravity at the earth's surface is measured by the acceleration of a body falling freely under its influence; it is usually denoted by g. It is found, from pendulum experiments, to vary slightly with the latitude, and also with the height above sea-level of the observing station. For any locality in the British Islands it is, however, little different from 32·2 feet per second. The following table gives the value of g for several places in the northern hemisphere:

Station	Latitude	Value of g in feet per second
Equator	0° 0′	32·091
Paris	48° 50′	32·183
Greenwich	51° 29′	32·191
Berlin	52° 30′	32·194
Dublin	53° 21′	32·196
Manchester	53° 29′	32·196
Edinburgh	55° 57′	32·203
Aberdeen	57° 9′	32·206
North Pole	90° 0′	32·255

From these figures it will be seen that a body apparently gains weight as it is carried from the equator to higher latitudes. This is due to two causes. First, owing to the ellipsoidal shape of the earth, gravitational attraction at the poles is $\frac{1}{500}$ greater than at the equator; (2) owing to the 'centrifugal force' of the earth's axial rotation, bodies at the equator are $\frac{1}{289}$ lighter than at the poles, where this cause does not affect their weight. These two fractions together make up the difference, $\frac{1}{194}$, between equatorial and polar gravity. The fraction denoting diminution of weight due to the centrifugal force of the earth's rotation, may be employed to find at what speed the earth would need to revolve in order that gravity would just be balanced by 'centrifugal force.' It is found that, to fulfil this condition, the earth would require to revolve at seventeen times its present speed; when revolving at this rate bodies would not have any tendency to remain on the earth's surface, and with an increased speed they would be projected into space. Taking also into consideration the diminution of gravity with increase of height, the value of terrestrial gravity is expressed by the formula $g = 32{\cdot}173 - {\cdot}082 \cos 2\lambda - {\cdot}000003\, h$ where λ is the latitude, and h the height, in feet, above sea-level. It must be remembered that this value of g is different from that which would be obtained were there no axial rotation of the earth; under the latter circumstances, the value of gravitational attraction alone would be $g = 32{\cdot}525 - {\cdot}026 \cos 2\lambda$.

To account for the phenomenon of gravitational attraction several theories have been advanced; but in spite of the best efforts of mathematicians and physicists, the real cause remains undiscovered. Nor is there any physical reason in evidence of the truth of the several assumptions upon which these theories have been based. As Clerk-Maxwell has pointed out, their chief value lies in their suggestiveness, and in there being an incentive to the deeper and more prolonged research after possible causes for gravitation. The earliest speculations on the subject were, of course, almost wholly metaphysical, and therefore misleading, if not absolutely erroneous. To begin with, the assignment of an attraction between the earth and sun as the cause of the earth's motion was set down as being impossible, on the plea that a body could not act in the place where it was not. Again it was urged that such a cause would be simply 'action at a distance,' and hence impossible. Newton's only speculation on the subject showed that he looked to some intervening medium as the agent by means of which attraction between bodies was exerted; that if bodies rarefied this medium round them at a rate lessening as the distance increased, gravitational attraction might thus be accounted for. Another hypothesis, and one of an entirely novel kind, was put forward in 1818 by Le Sage. He presupposed that space contains an exceedingly large number of small bodies moving rapidly in all directions. To these bodies he gave the name of ultramundane corpuscles. They would impinge upon any single isolated body in space in all directions, the result being that the body would not be moved, the impacts being equal on both its sides. But with two bodies in space, one would screen the other from a certain number of blows, so that on their opposed faces there would be a fewer number than on their distant faces; in consequence of this excess of impacts on one side over those on the other, each body would tend to move towards the other. The attraction between the two would be inversely as the square of their distance, and proportional to the surface of the bodies resolved normally to the line joining their centres. So that if mass be proportional to surface, there should be coincidence between the results of the hypothesis and the observed law. The chief objection to this hypothesis is that it would require not only that the corpuscles be infinitely small compared with the molecular distances in ordinary matter, but that they move at a speed enormous compared with anything we are acquainted with. Moreover the amount of energy required to maintain the gravitational attraction of a comparatively small body near the earth's surface would, if converted into heat, be sufficient to raise the earth to the temperature of incandescence. Sir William Thomson has shown that gravitation might be explained by the assumption of the existence of an incompressible fluid filling all space, being either created in each particle at a rate proportional to its mass, and flowing off everywhere to an infinite distance; or by each particle absorbing a quantity proportional to its mass, the supply coming in all directions from an infinite distance. Another method of accounting for gravitation is that of

Clerk Maxwell, who showed that if in a medium, such as that of the luminiferous ether, there be pressure along, and tension at right angles to the lines of force, the effect would be an attraction such as that of gravitation. The main objection to all these proffered hypotheses is that they presupposed the existence of quantities of energy in the universe which are absolutely enormous compared with the effects they produce; or, at all events, postulate some cause working not in accordance with the known laws of energy.

Gravity, SPECIFIC. See SPECIFIC DENSITY.

Gray, a town in the French department of Haute Saone, on the Saone, which is here crossed by a stone bridge of the 13th century, 25 miles NW. of Besancon. It has remains of an ancient castle of the dukes of Burgundy, some trade in corn, flour, and iron, and iron-industries and boat-building. Pop. 6737.

Gray, ASA, an eminent American botanist, born at Paris, Oneida county, New York, November 18, 1810. He took his degree of M.D. in 1831, but soon relinquished the practice of medicine, and devoted himself to his favourite study of botany. In 1834 he received the appointment of botanist of the United States exploring expedition to the southern seas; but, as a long delay took place before it was ready to sail, he resigned his post in 1837. He was afterwards elected professor of Botany in the university of Michigan, but declined the appointment, and in 1842 became Fisher professor of Natural History at Harvard. In 1873 he retired from the chair, but still retained charge of the great herbarium he had presented to the university in 1864; and in 1874 he succeeded Agassiz as a regent of the Smithsonian Institution. He ranks among the leading botanists of the age. His numerous writings evince equal ability in communicating elementary knowledge and in elucidating recondite theories. He came forward at a time when the old artificial systems of botany were giving way to the natural system which has taken their place, and he was the first in America, in conjunction with Dr John Torrey, to arrange the heterogeneous assemblage of species upon the natural basis of affinity; and he became an influential supporter of the Darwinian theories of evolution. In 1838 he commenced, with Dr Torrey, the *Flora of North America;* and in 1848-50 appeared the *Genera Florae Americae Boreali-Orientalis Illustrata.* Among his remaining works may be mentioned, besides memoirs on the botanical results of several government exploring expeditions, and a number of text-books that have long been in general use in the United States, *A Free Examination of Darwin's Treatise* (1861), *Darwiniana* (1876), and *Natural Science and Religion* (1880). He died 30th January 1888. A selection from his scientific papers was published in 2 vols. in 1889. He was a member of the principal learned societies of both America and Europe, to whose transactions and to periodicals he contributed much. His *Letters,* edited by Jane L. Gray, appeared in 1893.

Gray, DAVID, a minor poet, was born 29th January 1838, at Duntiblae, on the south side of the Luggie, about 8 miles from Glasgow. He was the eldest of the eight children of an industrious weaver, who gave him as good an education as he could at the Normal School and university of Glasgow, in the hope of making him a Free Church minister. But the boy began early to write verses, and seems to have made from the beginning an enormously exaggerated estimate of his own promise. In May 1860 he started for London along with Robert Buchanan, with the usual lofty hopes, and quickly met the usual discouragements. He made an appeal to Monckton Milnes, afterwards Lord Houghton, who found him some employment, but failed to get his poems printed. Meantime consumption seized him, and a stay in Devonshire, for which Milnes, Sydney Dobell, and other friends had found him the means, proving useless, he went home to his parents at Merkland, a mile from Kirkintilloch, to die. The end came quickly, 3d December 1861, but the day before he had had the happiness to hold in his hand a specimen page of the volume of his poems in print. The volume was entitled *The Luggie and other Poems* (1862), and was prefaced by an introduction by R. Monckton Milnes and a memoir by J. Hedderwick. His latest work was his best, and, indeed, the sonnets grouped together here under the title 'In the Shadows' are stamped with a solemn and touching beauty of their own. An enlarged edition, edited by Sheriff Glassford Bell, appeared in 1874. See also R. Buchanan's too high-pitched essay, in *David Gray, and other Essays* (1868).

Gray, ELISHA, an American inventor, was born at Barnesville, Ohio, 2d August 1835, and studied at Oberlin College, meanwhile supporting himself by working as a carpenter. He was afterwards engaged in the manufacture of telegraphic apparatus. His patents number about fifty, including several for the speaking telephone, of which he claims the invention, and others for a multiplex telegraph, by which he has succeeded in sending eight messages at a time.

Gray, JOHN EDWARD, English naturalist, born at Walsall in 1800, was educated for the medical profession. After assisting his father, author of *Supplement to the Pharmacopoeia,* in the preparation of his *Natural Arrangement of British Plants* in 1821, he entered in 1824 the British Museum as assistant in the Natural History Department, and in 1840 was appointed keeper of the Zoological Collections, a post which he retained till 1874. A few months later, on 7th March 1875, he died in London. To him belongs the merit of having made the zoological collections of the British Museum the most complete in the world. Dr Gray wrote much on subjects connected with his department. The titles of his books and papers number more than 500. Of these the most important are his catalogues of the British Museum collections, which are not mere lists, but are enriched with synonyms and ample notes. Next to these come *Illustrations of Indian Zoology* (1830-35) and *The Knowsley Menagerie and Aviary* (1846-60). Dr Gray also assisted in the formation of some of the most prosperous scientific societies of London, and was a vice-president of the Zoological Society.—His wife, MARIA EMMA, wrote *Figures of Molluscous Animals for the Use of Students* (5 vols. 1842-57).—His brother, GEORGE ROBERT GRAY (1808-72), an officer in the Zoological Department of the British Museum from 1831 till his death, is known as author of *The Genera of Birds* (1849), and of works on the birds of Polynesia and New Guinea.

Gray, THOMAS, one of the greatest of English poets, in value if not in bulk, was born in Cornhill, London, 26th December 1716. His father, Philip Gray, a money-scrivener, was of so violent and jealous a temper that his wife (Dorothy Antrobus) was obliged to separate from him, and it was mainly through her own exertions that the boy was placed at Eton, and afterwards at Cambridge, where two of her brothers were fellows of colleges, and afterwards tutors at Eton. Both the mother and her sister Mary loved the boy with a devotion that was rewarded by a life-long and passionate attachment. In 1727 he was sent to Eton, whither in the same year also came Horace Walpole, son of the prime-minister. As a boy Gray was shy and studious, and he carried the same temper to

Peterhouse, which he entered in 1734. The predominant mathematics in the studies of Cambridge were distasteful to his mind, and a habitual but passive melancholy early seized and mastered him. In the March of 1739 he was prevailed upon by Walpole to accompany him on the grand tour. They spent the next two and a half years visiting the towns and exploring the picture-galleries of France and Italy, and Gray's letters home reveal not only an exquisite taste in art and music, but also the first touch of that romantic love of nature which Rousseau was soon to make so fashionable. The two friends quarrelled at Reggio and parted. Walpole afterwards took the blame entirely on himself, and certainly by his efforts the breach was healed within three years, and the friendship never again interrupted. Gray reached England in the September of 1741, and seems now to have begun seriously to write poetry, his *Ode on Eton College* being written in the autumn of 1742, and the *Elegy* at least begun. In the winter he went back to Peterhouse, took his bachelorship in civil law, and became a resident there. For the next four or five years he studied Greek literature profoundly, and busied himself with abortive projects for editions of Strabo, Plato, and the Greek Anthology. This was perhaps the happiest period of his life, while he breathed the serene air of noble libraries, and was as yet untroubled by brøken health. He found his relaxation and his keenest pleasure in the company of his friends, and in writing, when absent from them, letters such as only men at that time could write. His holidays were spent with his mother and aunt at Stoke Poges, with Walpole at London, Windsor, and Strawberry Hill, or in travelling in different parts of the country. From his letters we see that he had a quick eye for the variety and colour of nature, and certainly he was almost the first of modern Englishmen to see the beauty as well as the horror in the Highland mountains—those 'monstrous children of God.'

In the summer of 1747 Dodsley printed Gray's famous *Ode on a Distant Prospect of Eton College*, and early next year reprinted it with two other pieces in his *Miscellany*. The death of Gray's aunt, Mary Antrobus, in the November of 1749 appears to have brought back to his recollection his *Elegy*, and he seems about June 1750 to have finished it where he began it seven years before—at Stoke Poges. This humane and stately poem is perhaps the best-known piece of English verse, a masterpiece in the balanced perfection of a metre that beats true to the pulse of human sympathy in the solemn alternation of passion and reserve, and especially happy in a subject that can never lose its interest for mankind. The poem was sent to Walpole, was handed about in manuscript, and soon became so well known that Gray was forced to print it in the February of 1751. Early in March 1753 appeared in a thin folio the *editio princeps* of Gray's collected poems, with designs by Bentley, only son of the famous Master of Trinity. Gray's mother died 11th March 1753, and was buried at Stoke Poges, with an exquisitely simple and affecting epitaph from her son's pen upon her tombstone.

Walpole said that Gray was 'in flower' during the years 1750–55, and during this period he commenced his most ambitious poems, the *Pindaric Odes*, the splendidly resonant *Progress of Poesy*, perhaps his really greatest work, being finished by the close of 1754. *The Bard*, begun at the same time, was not completed till the summer of 1757. Gray had long had a nervous horror of fire, and had fixed a rope-ladder from his window in Peterhouse by which to escape in emergency. One night in February 1756 he was roused from sleep by a pretended alarm of fire, and, without staying to put on his clothes, descended from his window into a tub of water that had been placed under his window by some frolicsome undergraduates. Displeased at the authorities of Peterhouse for not punishing this brutal practical joke, the poet migrated in 1756 to Pembroke Hall, where he spent the remaining fifteen years of his life surrounded by congenial friends, in the midst of his books, his china, his pictures, and his flowers. His two odes were printed at Strawberry Hill in 1757, and were admitted to have put their author at one bound at the head of living English poets. The laureateship was offered him in 1757 on Colley Cibber's death, but declined. During the years 1760 and 1761 he devoted himself to early English poetry, of which he intended to write a history; later he made studies in Icelandic and Celtic verse, which bore fruit in his Eddaic poems, *The Fatal Sisters* and *The Descent of Odin*—genuine precursors of romanticism. In 1768 he collected his poems in the first general edition, and accepted the professorship of History and Modern Languages at Cambridge, an office which entailed no duties and yielded an income of £400 a year. Johnson in his perverse life of Gray made, from 'a slight inspection of his letters,' one solitary remark that showed insight, that Gray 'was a man likely to love much where he loved at all.' Certainly no silent and melancholy poet was ever more happy in his friendships, and few men have been loved with such singleness and devotion. His biographer Mason's affection was not entirely disinterested, but the love of friends like Nicholls, Bonstetten, Robinson, Wharton, Stonehewer, and Brown proves that there must have been some singular charm in the object on which it was lavished.

Gray's latest journeys were made to Glamis Castle and to the Cumbrian lakes, the beauties of which he was the first to discover. He was now comparatively rich, and enjoyed a reputation peculiarly dear to a scholar's heart, and his life glided quietly on, troubled only by fits of dejection and by attacks of hereditary gout. As he was dining one day in the college hall at Pembroke, a severe attack seized him, and after a week's suffering he died, 30th July 1771. He was buried fittingly by his mother's side in his own Country Churchyard—Stoke Poges.

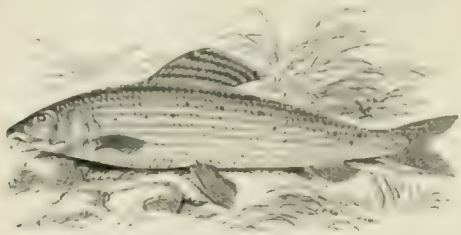
Gray said of his own poetry that 'the style he aimed at was extreme conciseness of expression, yet pure, perspicuous, and musical.' The excellence he aimed at he attained, and in his lyrical work, moreover, he reached in a high degree the Greek quality of structure, especially in his *Pindaric Odes*. 'I do not think,' says Edward Fitzgerald, 'that his scarcity of work was from design: he had but a little to say, I believe, and took his time to say it.' At anyrate all his work bears the stamp of dignity and distinction, and it was perhaps as much the fault of the chilling atmosphere of his age as of his own hyper-refinement of taste or intermittency in the fits of creative fancy that its quantity was so little. Yet this slender garland of verse has been sufficient to give Gray his rank among the *dii majores* of English poetry.

The earlier Lives of Gray and editions of his works by Mason and Mitford have been superseded by the study by Edmund W. Gosse (1882) in the 'English Men of Letters' series, and by the same editor's complete edition of his works in prose and verse, including as many as 349 of his letters (4 vols. 1884). See also the essay by Matthew Arnold in vol. iii. (1880) of T. H. Ward's *English Poets*.

Gray's Inn, one of the four Inns of Court (q.v.) in London.

Grayling (*Thymallus*), a genus of fresh-water fishes in the salmon family, distinguished from trout, &c. by the smaller mouth and teeth, and by the long many-rayed dorsal fin. The genus is

represented by five species, inhabiting clear streams in north Europe, Asia, and North America. The British Grayling (*Th. vulgaris*) has a wide but local distribution; it prefers rivers with rocky or



Grayling (*Thymallus vulgaris*).

gravelly bottom and an alternation of stream and pool. The back and sides are silvery gray, with longitudinal dusky streaks; the dorsal fin is crossed by rows of spots. The fish, which may attain a weight of 4 to 5 lb., is esteemed for the table, but should be cooked when newly caught, when it has an odour compared to that of wild thyme. It spawns in April or May, and is in best condition when trout are out of season, in October and November. Another well-known species is *Th. signifer*, a beautiful fish from the clear affluents of the Mackenzie River, called 'Hewlukpowak,' or 'fish with the winglike fin,' by the Eskimos, and 'poisson bleu' by the Canadian voyageurs. See Pritt, *The Book of the Grayling* (1888); Walham, *Grayling, and how to catch them* (1895).

Graystone, Graywacke, &c. See GREYSTONE, GREYWACKE, &c.

Graz. See GRATZ.

Grazalema, a town of Spain, situated in a very strong natural position 53 miles ENE. of Cadiz. Its 8000 inhabitants are principally engaged in manufacturing cloth and in smuggling.

Grease, a term of general application to all oily or fatty matters, but generally to those having some degree of solidity, as tallow. It is more specially applied to fatty matters which are so deteriorated by dirt or other impurities as to be unfit for candle-making and other manufactures requiring some degree of purity in the material. Grease is largely employed as a lubricant for heavy machinery, and especially for the wheels of carriages. The grease employed for the axles of wagons and carts consists of inferior kinds of grease mixed with a little tar. On English railways grease is used for goods and mineral wagons; for passenger carriages palm oil is used. See LUBRICANTS. For a disease of horses, see WEED.

Great Basin, a remarkable triangular plateau of North America, occupying the western portion of Utah and nearly the whole of Nevada, as well as a section of Oregon and California, and extending at its north-eastern angle into Idaho. It is bounded on the W. by the Sierra Nevada, and on the E. by the Wahsatch Mountains. The base of the triangle, in the N., is some 500 miles from east to west; it extends from N. to S. for nearly 800 miles, and its area is slightly greater than that of France. It is girdled round on every side by high mountains, and traversed throughout by numerous ranges, frequently parallel, yet as often irregularly blending or crossing; the valleys are usually sinks, the chief drainage centre being Great Salt Lake (q.v.), and the Humboldt and Carson sinks, at about the same elevation. It has been pointed out by the United States Geological Survey that the Great Basin's areas of greatest depression are to be found near the borders, while its central portion reaches a much greater elevation. The loftiest range is the East Humboldt, near the middle, which culminates in Mount Bonpland (11,321 feet). Volcanic masses form or conceal the original rocks of many of these ranges. The Great Basin contains many streams and lakes, the latter for the most part salt, whose waters never reach the ocean, but are either taken up by evaporation or sink in the desert sands. The mean annual rainfall ranges in different localities from 4 to 15 inches. The plateau is nearly destitute of trees, and in general only the upper parts of the valleys are clothed with desert shrubs, their lower portions often being occupied either by bodies of water or by a muddy bottom covered with several inches' depth of alkaline salts left by evaporation.

See, besides reports to the United States Geol. Survey, works by I. C. Russell on Lake Lahontan (1883 and 1885) and Southern Oregon (1884); and Hague, *The Volcanic Rocks of the Great Basin* (1884).

Great Bear Lake. See BEAR LAKE, GREAT.

Great Britain. Under this head are noticed (1) the island of Great Britain—its geology and geography; and (2) the United Kingdom of Great Britain and Ireland—its general statistics, &c.

Great Britain was so called to distinguish it from Britannia Minor, or Brittany, in France (see BRITANNIA). The name was a poetical or rhetorical expression till in 1604 James I. styled himself king of Great Britain, although the term was proposed in 1559 by the Scottish Lords of the Congregation. Lying between 49° 57′ 30″ and 58° 40′ 24″ N. lat., and between 1° 46′ E. and 6° 13′ W. long., Great Britain is the largest island of Europe. It is bounded on the N. by the Atlantic, on the E. by the North Sea, on the S. by the English Channel, and on the W. by the Atlantic, the Irish Sea, and St George's Channel. The most northerly point is Dunnet Head, in Caithness; the most southerly, Lizard Point, in Cornwall; the most easterly, Lowestoft Ness, in Suffolk; and the most westerly, Ardnamurchan Point, in Argyllshire. Its greatest length is about 608 miles, and its greatest breadth (from Land's End to the east coast of Kent) about 325 miles; while its surface contains 88,226 sq. m.

Geology.—The geology of Great Britain is of peculiar importance. The fossiliferous strata having been first systematically studied and expounded here, British geologists have given to the world the names whereby most of the larger divisions and subdivisions of these strata are known. Nearly all the recognised 'systems' occur in Britain, although some of these are more fully represented elsewhere. Indeed, the only system not found in Britain is the Miocene—the beds formerly classed as of this age being now included in the Oligocene. British geology is no less important from the influence it has had in the development of the country. The mineral wealth, especially the coal and the iron, are the real sinews and muscles of Britain's mighty power. No other country has similar advantages in such an area. (See also the article on the geology of EUROPE.)

We shall, in this sketch of the distribution of the British rocks, follow the order of the strata, beginning with the lowest and oldest. It may be said that, in general, the mountainous regions of the north and west are formed of the oldest rocks, and that, as we move south-eastwards, we gradually pass over newer strata, until, in the east of England, we come to the uppermost divisions of the Tertiary.

The base rocks of the whole series occur in the Outer Hebrides, in Rona, Tiree, and Coll, and along the western shores of Sutherland and Ross. They are assigned to the Archæan System (q.v.), and consist chiefly of coarse gneiss, usually hornblendic,

and various schists, with occasional crystalline limestones—the whole series being veined more or less abundantly with pegmatite. Small isolated areas of Archæan occur also in England (Charnwood Forest, the Wrekin, the Malverns). No fossils are met with in any of the Archæan rocks.

The oldest fossiliferous strata in Britain belong to the Cambrian System (q.v.), and are well developed in Wales and Shropshire, attaining a thickness of more than 30,000 feet. They consist chiefly of dark-red and purple sandstones, grits, and conglomerates, with green slates and slaty shales. The fossils are not abundant, but show a remarkable variety of forms. In Scotland the Cambrian appears to be represented by the red grits, conglomerates, and sandstones which rest directly on the Archæan rocks of the outer Hebrides and the north-west Highlands.

The *Silurian System* (q.v.) occupies a large portion of the surface of the country. The typical rocks occur in Wales, extending over the western portion of the principality from Pembroke to Denbigh, and including the northern portions of Pembroke, Carmarthen, and Brecknock, the whole of Radnor and Montgomery, the south-west of Denbigh, and the whole of the counties to the west. The oldest or Lower Silurian beds are next the coast. The series consists of an immense thickness of shales, slates, grits, and greywackes, with intercalated limestones more or less pure. Immense tracts have hitherto proved devoid of fossils; in other districts the calcareous rocks are almost entirely composed of the remains of marine invertebrate animals, while the shales abound in zoophytes and crustacea. The high lands in the north of Lancashire and south of Westmorland are Silurian; but it is in Scotland that these strata are most extensively developed. A line drawn from Dunbar to Girvan forms the northern limit of these beds in the south of Scotland. Except the lower half of the valley of the Tweed, the whole region from this line to near the base of the Cheviots is Silurian. The rocks are chiefly greywacke, with scattered beds of impure limestone. The chief fossils are graptolites, crustacea, brachiopoda, and mollusca. The lead-mines of Wanlockhead and Leadhills are in this district. East and south-east of the Archæan and Cambrian rocks of the north-west Highlands come Silurian rocks which are more or less metamorphosed. Up to recent years geologists believed with Sir R. I. Murchison that all the schists, &c., lying to the east of the Cambrian and Archæan areas, and extending down to the borders of the lowlands in Strathmore, &c., were altered Silurian strata. Probably this is the fact, but the work of the Geological Survey in the north-west Highlands has suggested some doubts. A line drawn from Stonehaven to Helensburgh marks the southward range of those schists and slates, &c.

The *Old Red Sandstone System* (q.v.), consisting of conglomerates, coarse and fine grained sandstones, and dark-coloured flagstones and shales, with characteristic fossils of ganoid and placoid fish, overlies the Silurian in several districts in Scotland. Nearly all Caithness and the seaward portions of Sutherland, Ross, Cromarty, Inverness, Nairn, and Elgin, belong to these strata. A broad band, extending on the east coast between Stonehaven and St Andrews, stretches across the country to Helensburgh and Dumbarton on the west. The same strata appear again in Haddington, Berwick, and Roxburgh, in Lanark, and in Ayrshire. Old Red Sandstone likewise occurs in South Wales and the neighbouring English counties, extending from the Silurian district to the Severn and the Bristol Channel, and containing in a large basin the South Wales coalfield. The highly fossiliferous strata of north Devon, and of south Devon and Cornwall (Devonian system) are believed to be on the same geological horizon as the Old Red Sandstone. They consist of slates, sandstones, and limestones, and contain numerous corals and shell-fish.

The *Carboniferous System* (q.v.) may be said to occupy a broad tract extending from the Bristol Channel to the base of the Cheviots. The strata are not continuous between these limits, but are broken up in some places by the appearance on the surface of older strata, while in others they are covered by newer deposits. The various detached coalfields are (1) the South Wales, in Glamorgan and Pembroke; (2) the Bristol, and (3) the Forest of Dean, in Gloucester; (4) the Forest of Wyre, in Worcester; (5) Shrewsbury, and (6) Coalbrookdale, in Shropshire; (7) north and (8) south Staffordshire; (9) Warwickshire; (10) Leicestershire; (11) Flint and Denbigh; (12) Lancashire; (13) York and Derby; (14) Cumberland; and (15) Northumberland and Durham. In the northern portion of this great tract of carboniferous strata, where the millstone grit and carboniferous limestone are largely developed, few seams of coal of any value are contained. The limestone in Derby is rich in metallic ores. The carboniferous strata of the north of England extend beyond the Cheviots into Scotland, forming a narrow band from the Solway to the North Sea, in the counties of Dumfries, Roxburgh, and Berwick. The only coalfield in this district is one of small extent at Canonbie, in Dumfriesshire. The carboniferous strata in Scotland, with the exception just stated, are confined to the immense trough between the Silurian and Old Red Sandstone systems on the south and the Old Red Sandstone on the north, which is completely occupied by them, except where underlying older strata rise to the surface. Considerable tracts of sandstone and limestone without coal break up the coal-bearing beds into the following coalfields: the Midlothian, the Fife, the Lanark and Stirling, the Ayrshire, the Sanquhar in Dumfriesshire. Beside coal, the whole of the carboniferous series contains immense stores of argillaceous carbonate of iron, from the ore of which is produced the great bulk of the iron used in the country. The sandstones of this period form beautiful and durable building-stones, the limestones are of great commercial value, and many of the less indurated shales are good fireclays.

The *Permian System* (q.v.), consisting of magnesian limestone and sandstone coloured with oxide of iron, occupies a considerable area in Durham, and borders the carboniferous rocks in Dumfries, Cumberland, Westmorland, Lancashire, Cheshire, Shropshire, Stafford, Worcester, Warwick, Nottingham, and York, and in Glamorgan. The sandstone is quarried for building.

The typical triple series of the *Triassic System* (q.v.) occurs in Germany; the British representatives consist of variously-coloured sandstones and marls. They occupy a considerable surface in Lancashire, Cheshire, Shropshire, and Stafford, and extend as a ribbon of varying breadth, from the mouth of the Exe, through Devon, Somerset, Gloucester, Worcester, Warwick, Leicester, Nottingham, York, and Durham, to the coast at Hartlepool. The only deposits of rock-salt in Britain occur in the Triassic rocks of Cheshire and Worcestershire.

The *Jurassic System* (q.v.) is composed of an extensive series of limestones, marls, sandstones, and shales, which stretch in a broad belt from Yorkshire to Dorsetshire, passing through Lincoln, Worcester, Warwick, Northampton, Huntingdon, Bedford, Buckingham, Oxford, Gloucester, and Wilts. The best building materials in England

are obtained from these strata. Jurassic strata occur in Scotland at Brora (Sutherland), in Skye, &c. In the Brora Oolite a seam of coal 3½ feet in thickness has been worked off and on since 1820. It is the thickest bed of pure vegetable matter detected in any Mesozoic formation in Britain.

The *Cretaceous System* (q.v.), consisting chiefly of chalk with underlying sands and clays, all very rich in fossil remains, occupies a broad tract to the east of the Jurassic strata, and parallel to them. Beginning a little north of Flamborough Head, the cretaceous strata may be traced through York and Lincoln, then across the Wash into Norfolk, Suffolk, Hertford, Buckingham, Oxford, Berks, to Hampshire, where they separate into three arms, the one extending south-westward through Wilts and Dorset to the south coast; another taking a south-east direction to Beachy Head; while the third stretches as a narrow band in an easterly direction through Surrey and North Kent, widening out as it nears the coast, where it occupies the district between Ramsgate and Folkstone. The fresh water *Wealden series*, with its abundant remains of reptiles, fishes, shells, and insects, is developed chiefly over the tract that lies between the North and South Downs.

The *Eocene System* (q.v.), consisting of clays, sands, and marls, abounding in fossils which apparently indicate a subtropical climate, occupies the valley of the Thames, from Hungerford to the sea, and from Canterbury to Saxmundham, as well as a large district in Dorset, Hants, and Sussex, from Salisbury west to Dorchester, and east almost to Hastings.

The *Oligocene System* (q.v.) is very sparingly developed in Britain—the only deposits of note occurring in Hampshire and the Isle of Wight.

The *Pliocene System* (q.v.), consisting of ferruginous shelly sand and marl known as crag, occurs chiefly in Suffolk and Norfolk. The still more recent *Pleistocene System* (q.v.) is represented by superficial accumulations of alluvium, gravels, boulder-clay or till, bedded clays, &c., which are scattered over wide areas. To the same system belong the cave-deposits with relics and remains of primeval man.

Minerals.—In some respects the most important of British minerals is *coal*. The greatly-increasing consumption of coal has originated fears as to the possibility of the exhaustion of our mineral fuel (see COAL).—Formerly, the only *iron* produced in the country was obtained from the greensand of the south-east of England, and from the brown hematite of the Dean Forest. The ore was smelted with charcoal. But the introduction of coke and coal for smelting, and the discovery of numerous additional and unthought-of deposits, especially in connection with coal-bearing strata, immensely increased the production of iron, and met the greatly-increased demands for this important metal. In 1760, when charcoal alone was used for smelting, not more than 25,000 tons of iron were produced; now an average of 4,000,000 or 5,000,000 tons are obtained from some 12,000,000 or 13,000,000 of ore. The most important ore is the ferruginous shale, or impure argillaceous carbonate of iron, found in every British coalfield. The brown and red hematites, associated with the oldest Palæozoic rocks, yield much metallic iron.—*Tin* is obtained from two counties—Cornwall and Devon.—*Copper* is obtained from the same two counties, but the quantity obtained in Britain has greatly declined since 1860, and is trifling compared with what is smelted from imported ores. Other copper mines are or were in Lancashire, Carmarthen, and Anglesey (see COPPER).—*Lead* and *Silver* are obtained from the same ore from numerous mines in Palæozoic districts. The most productive English mines are in Northumberland, Durham, Cumberland, Shropshire, Yorkshire, Derbyshire, Cardiganshire, Glamorganshire, and the Isle of Man. Small quantities are obtained in Somerset, Westmorland, Stafford, and Chester. All the Silurian counties of Wales contain mines. The Isle of Man yields much ore. In Scotland the most productive mines are at Wanlock head and Leadhills.—*Zinc* is obtained chiefly from Cardigan, Denbighshire, Carnarvon, Flint, Cumberland, and the Isle of Man.—*Sulphur Ores* (iron pyrites) are raised in different parts of Great Britain.—The following minerals are also raised—viz. arsenic, manganese, gold, nickel, silver-copper, fluor-spar, and wolfram.—*Salt* occurs chiefly in Cheshire and Ulster.

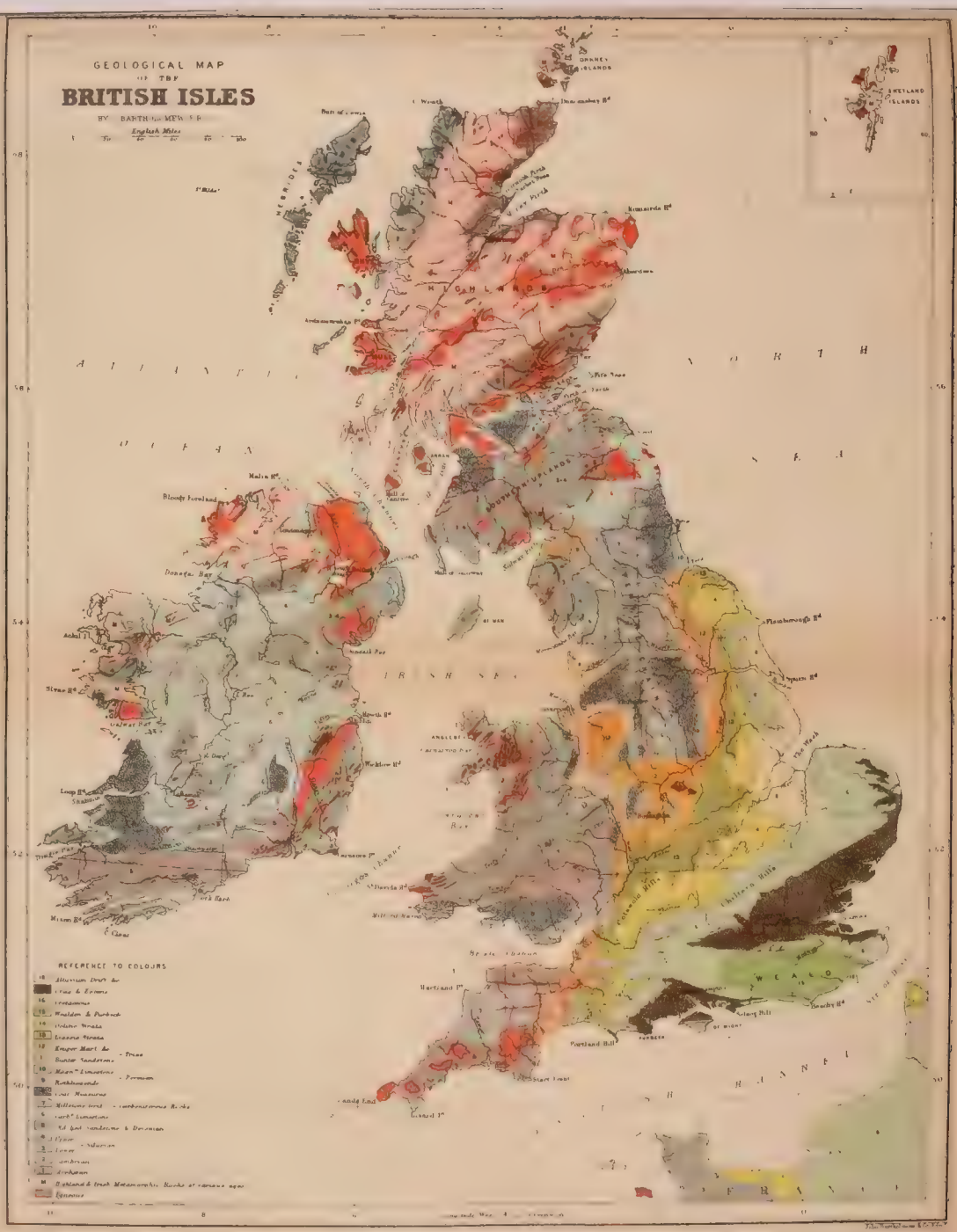
The following table shows the minerals raised in the United Kingdom in 1888, with their value at the mines:

		Quantities	Value at the Mines
Arsenic clay (Blackdown)	tons	2,000	£4,850
Arsenic shale	"	1,984	248
Antimony ore	cwt.	74	7
Arsenic	tons	1,624	5,197
Arsenical pyrites	"	5,325	1,240
Barytes	"	20,191	26,147
Bog-manganese	"	10,957	5,465
China clay (kaolin or pipe-clay)	"	2,566,729	653,119
Coal	"	169,967,210	32,971,276
Cobalt and nickel ore	"	152	746
Copper ore	"	17,134	60,980
Copper precipitate	"	418	6,539
Fluor-spar	"	110	153
Gold (fine)	oz.	5,843	27,300
Gypsum	tons	120,485	58,998
Iron ore	"	14,500,715	3,501,317
Iron pyrites	"	23,507	11,302
Jet	lb.	2,217	332
Lead ore	tons	34,[illegible]	1,[illegible]58
Lignite	"	971	437
Manganese ore	"	1,342	1,074
Oil-bearing shale, &c.	"	7,173	13,387
Oil shale	"	2,076,469	519,126
Petroleum	"	35,[illegible]	
Phosphate of lime	"	22,500	43,312
Salt	"	2,305,569	700,859
Slates and slabs	"	171,788	1,057,535
Stone, &c.	"		8,694,697
Sulphate of strontia	"	7,064	3,532
Tin ore	"	14,[illegible]70	894,665
Tin-stone of soda	"	2[illegible]	54
Wolfram	"	60	1,625
Zinc ore	"	26,408	91,984
Total values.....			£59,834,997

The total value of the coal and other minerals raised in the United Kingdom was £40,345,945 in 1866, £74,094,638 in 1880, and £69,129,664 in 1895. The total value of the metals obtainable by smelting from ores produced in the United Kingdom (aluminium, antimony, copper, gold, iron, lead, magnesium, silver, sodium, tin, zinc) in 1887 was £12,795,993; in 1898, £13,717,512.

Physical Geography.—The physical features of a country are intimately connected with its geological structure. Thus the Highlands and Southern Uplands of Scotland are built up chiefly of crystalline schists and the older Palæozoic strata, while the intervening lowlands of the so-called Central Plain are composed mainly of the younger Palæozoic rocks and overlying accumulations of superficial deposits. The mountainous tracts of Scotland consist therefore of more enduring or less readily eroded materials than the lowlands. Any wide tract of the Highlands (built up largely of crystalline schists and granitic rocks), when viewed from a commanding position, looks like a tumbled ocean in which the waves appear to be moving in all directions. The mountains are massive, generally round shouldered and often even flat-topped, while there is no great disparity of height among the dominant points of any individual group. This is the result of denudation, guided and controlled by the petrological character and geological structure of the rocks. The mountains are monuments of erosion; they are the wreck of an old tableland, the upper

PHYSICAL MAP
OF THE
BRITISH ISLES
Faroe Shetland Depression
Shetland Islands
Yell
Unst
Fetlar
Sumburgh Head
Orkney Islands
Sunday
Westray
Pentland Firth
Duncansby Hd
Dunnet Hd
Cape Wrath
Butt of Lewis
Hebrides
Lewis
Harris
North Uist
South Uist
Rum
Skye
Mull
Islay
Colonsay
Tyree
Coll
Rockall
Deppression
Rockall Bank
Minch
Little Minch
The Minch
Moray Firth
Kinnaird Head
Buchan Ness
Buchan Deeps
Long Forties
Fife Ness
Firth of Forth
St Abbs Head
Holy I
Farn Is
Mull of Kintyre
Norwegian Depression
NORTH SEA
English Miles


GEOLOGICAL MAP
OF THE
BRITISH ISLES
BY
English Miles
ORKNEY ISLANDS
SHETLAND ISLANDS
HIGHLANDS
SOUTHERN UPLANDS
ATLANTIC
NORTH SEA
IRISH SEA
ENGLISH CHANNEL
WEALD
REFERENCE TO COLOURS

PHYSICAL MAP
BRITISH ISLES
Shetland Islands
Orkney Islands
Cape Wrath
Kinnaird Head
Buchan Ness
North East
North West
Malin Head
Fair Isle
Flamborough Head
Bristol Channel
Hartland Point
Lizard Point
Land's End
Scilly Isles
Start Point
Portland Bill
Beachy Head
Dungeness
North Foreland
Thames
Wash
Central Plain
Plain of London
Salisbury Plain
Middle Downs
South Downs
North Downs
Chalk Hills
Cheviot Hills
Grampians
Ben Nevis
Ben Lomond
Ben Cruachan
Ben Lawers
Ben More
Ben Macdui
Cairngorm
Ben Wyvis
Ben Hope
Ben Arkle
Ben Klibreck
Ben Alder
Ben Lui
Ben Venue
Ben Ledi
Ben Vorlich
Ben Chonzie
Ben Voirlich
Ben Cleuch
Ben Lomond
Ben Arthur
Ben Donich
Ben Cruachan

ATLANTIC OCEAN
Cornish Plain
Bristol Channel
Hartland Point
Land's End
Scilly Is.
Start Point
Beachy Head
St Albans Head
Portland Bill
Flamborough Head
Spurn Head
Central Plain
Eastern Plain
Chiltern Hills
North Downs
South Downs
Salisbury Plain
Cambrian Mts
ENGLISH CHANNEL
Channel Islands
FRANCE

surface and original inclination of which are approximately indicated by the summits of the various mountain-masses and the direction of the principal rivers. The Highlands are intersected from south-west to north-east by the Great Glen, which probably occupies the line of a dislocation. It is customary in geographical text-books to speak of the 'range of the Grampians,' but the Highland mountains do not trend in linear directions, but rather form confused groups. It is probably owing to the fact that many of the rivers and streams run in certain more or less definite directions that the mountains have been described as linear ranges. The greatest height reached is 4406 feet in Ben Nevis, which is the culminating point of the Highlands (q.v.), less eminences being Ben Macdhui (4296 feet) and Ben Lawers (3984; with cairn, 4004). The southern limit of the Highlands is defined by a line drawn from the Firth of Clyde at Helensburgh north-east to the sea-coast at Stonehaven. North of this line there are of course considerable tracts of less elevated ground, especially along the coast in Aberdeenshire and the borders of the Moray Firth. Caithness is another comparatively low-lying and gently undulating plain. The coast-line of the Highlands, particularly in the west, is repeatedly broken by numerous and large fiords or sea-lochs, in which the sea is usually abnormally deep. And opposite the same coasts appear the numerous islands of the Inner and Outer Hebrides. These fiords are simply submerged land-valleys, while the islands referred to are the higher parts of the depressed continental plateau. There is reason to believe that at a very late geological date the Scottish coasts extended outwards to what is now the contour line of 100 fathoms. One of the most marked features of the Highlands is the multitude of fresh-water lakes. These vary in size from mere tarns to large mountain-valley lakes like Lochs Lomond, Ness, Awe, Shin, Maree, Tay, &c., and most of them occupy rock-basins, which are comparable in character to the deep hollows that occur in the sea-lochs.

The Central Plain of Scotland may be described as a broad depression of relatively easily eroded materials lying between two tablelands of less readily denuded rocks. The principal features of this low-lying tract have a north-east and south-west trend determined by geological structure, as is seen in the Sidlaw Hills, the Ochil Hills, the Lennox Hills, &c., in the north, and in the Pentland Hills in the south. The surface of the lowland tracts is likewise diversified by many more or less abrupt and isolated hills, such as Arthur's Seat, Dalmahoy Crags, the 'Castle-rocks' of Edinburgh and Stirling, &c. Most of these heights consist of igneous rocks of a more durable character than the strata of sandstone, shale, &c., which surround them.

The Southern Uplands of Scotland form a broad belt of high ground extending from the sea-coast of Haddingtonshire and Berwickshire south-west to the shores of Ayrshire and Galloway. Like the Highlands the area of the southern uplands is simply an old tableland, furrowed into narrow ravine and wide dale by the operation of the various agents of erosion. The general configuration of this upland tract is somewhat tame and monotonous. The mountains are flat-topped elevations with broad rounded shoulders and smooth grassy slopes. They do not run in linear directions but form irregular groups and masses. The rocks that enter into their composition are chiefly Silurian, greywackes, and shales, and consequently there is less variety of contour and colour than in the Highlands. The hills are not only flatter atop but are generally much smoother in outline, there being a general absence of those beetling crags and precipices which are so common in the Highlands. Now and again, however, the mountains assume a rougher aspect, more especially in Carrick and Galloway, where the highest point (Merrick, 2764 feet) of the southern uplands is reached. The Silurian strata are overlaid towards the south by younger Palæozoic rocks, consisting principally of sandstone and igneous rocks which gave rise to different orographic features. Thus we have the broad vale of Tweed and the lower reaches of Teviotdale occupied chiefly by sandstones and shales. The Cheviot Hills, again, are built up in the north-east chiefly of bedded igneous rocks which towards the south-west give place to sandstones that form broad elevated moors and serve to connect the Cheviot Hills with the loftier Silurian uplands lying to the north-west. In this region of sandstones, &c., not a few of the hills are conical in shape—a form due to the presence of cappings of relatively harder igneous rocks.

Crossing the borders of Scotland and England we find the high ground just referred to is continued southwards through Northumberland, Cumberland, Durham, Yorkshire, Lancashire, and Derbyshire to form what is called the Pennine Chain. This 'chain' varies in height from 1200 to 3000 feet, reaching its highest summit in Scafell Pike, Cumberland, which is 3210 feet high. When the hills are composed chiefly of sandstones and shales, they show generally a somewhat rounded and monotonous outline, but in the regions where thick limestones abound these usually give rise to more or less bold and abrupt escarpments. The Lake district of Cumberland and Westmorland, being built up mainly of Silurian rocks, reproduces the characteristic features of the southern uplands of Scotland. And the same is to a large extent true of the mountainous parts of Wales (whose highest point, Snowdon, is 3571 feet), while not a few of the features of the Scottish Highlands reappear on a small scale in Devonshire and Cornwall. All these hillier tracts are composed essentially of Palæozoic and associated igneous rocks. The major portion of England, however, consists principally of younger strata, and may be considered on the whole as a somewhat undulating plain traversed by ridges of varying elevation, which trend in a general direction from north-east to south-west. The band of Jurassic strata, extending from the Yorkshire Moors south and south-west to the coast of Dorset, forms a tortuous belt of tableland and escarpment, rising sometimes to a height of 1500 feet, and throughout its course presenting usually a bold face to the west and a gentle slope to the east. This configuration is the result of geological structure—the escarpments corresponding to the outcrop of the relatively harder members of the Jurassic system, which are underlaid and overlaid of more readily eroded strata, while the general inclination of the strata is to the east and south-east. Similar escarpments accompany the outcrop of the chalk, but they are neither so lofty nor so bold. They form the Wolds of Yorkshire and Lincoln, and rise into a low range of hills that extend from Norfolk to Wilts, the more prominent portions of which are known as the Chiltern Hills, the Marlborough Downs, and Salisbury Plain. On the north and south side of the Wealden anticlinal axis, similar chalk hills appear, forming the North Downs in Surrey and Kent, and the South Downs in Hants and Sussex. Lying between the Pennine Chain in the west, and the Yorkshire Moors and Wolds and Lincoln Heights and Wolds in the east, lies the broad depression traversed by the Ouse and Trent which is occupied chiefly by Triassic strata. In like manner, a low plain separates the mountain-tracts of Wales from the Pennine Chain, which is similarly occupied by Triassic and younger Palæozoic strata. The maritime parts of Lincoln, Norfolk, Suffolk, Essex,

and Middlesex are for the most part low lying, being composed of Cretaceous and overlying Tertiary and Quaternary deposits. Thus, in England as in Scotland, the loftier and bolder tracts of the country are met with in the regions occupied by the indurated rocks of the older Palæozoic series. It is in those regions where the most picturesque and diversified scenery occurs. A considerable number of estuaries penetrate the coast-lines of England and Scotland, south of the Highland area, but none of these recalls the characteristic features of the deep sea-lochs of the Highland seaboard. The mountain valleys of southern Scotland, of England and Wales, are not submerged—the firths and estuaries of such regions being simply the submerged lower reaches of lowland valleys. The whole surface of Britain, with the exception of the extreme south of England, has been more or less modified by glacial action, to which is largely due the rounded contour and flowing outline of all but the highest elevations. The surface-features of the low-lying tracts have also been greatly modified by the enormous morainic and fluvio-glacial accumulations which were spread over the country in Pleistocene times. Notwithstanding all such modifications, however, the prevailing influence of petrological character and geological structure in determining the orographic features of the country is everywhere conspicuous.

The physical geography of Ireland is discussed elsewhere (see IRELAND); here all that need be said is that in its geological relations it is intimately related to Great Britain—its orographic features being likewise determined by the character of its various rock-masses. Ireland, like its sister island, forms a portion of the depressed continental plateau—its highly indented coast-line, more especially in the west and south-west, being the result of a comparatively recent submergence. There can be no doubt that in post-glacial times Ireland was joined to Britain which at that period formed a part of the continent of Europe. See EUROPE (*Geology*).

Meteorology.—The climate of Great Britain derives its peculiar character from the insular situation of the country, taken in connection with the prevailing direction of the winds. It is mild and equable in a remarkable degree, the winters being considerably warmer, and the summers colder than at other places within the same parallels of latitude. For at least three months, the mean monthly temperature ranges between 50·0° and 60·0°; for other three months it continues about 60·0°, or occasionally a little higher, seldom more than four degrees; and for the remaining six months it ordinarily ranges between 36·0° and 48·0°. Since the Reports of the Registrar-general clearly prove that the temperature most conducive to health is between 50·0° and 60·0°, it follows that, as far as concerns temperature, the climate of Great Britain is one of the healthiest in the world.

As appears from data furnished by the Reports of the English and Scottish Meteorological Societies, the mean temperature of England is 49·5°, and of Scotland 47·5°. The mean temperatures of the following places, arranged according to the latitude, have been deduced from the same sources: Guernsey, 51·5; Falmouth, 51·4; Ventnor, 51·1; Barnstaple, 51·4°; Bournemouth, 50·8°; Greenwich, 50·3; Bedford, 49·9; Derby, 48·8; Liverpool, 49·3; Manchester, 48·6°; Isle of Man, 48·8°; Scarborough, 47·8; Milne Graden (Berwick), 47·5; Leith, 47·2; Rothesay, 47·8; Greenock, 47·6; Arbroath, 47·0; Culloden, 46·6°; Tongue, 46·3°; Sandwick (Orkney), 45·8°; and Bressay (Shetland), 45·0°. There is thus a difference of fully six degrees between Falmouth, in Cornwall, and Shetland. This difference is chiefly attributable to the difference of their latitudes. It becomes greater as the force of the sun's rays increases; so that, while the winter temperatures are respectively 44·2° and 39·0°, the summer temperatures are 60·6° and 53·4°. The highest summer temperature is 64·2° in London, and the lowest 52·2° at North Unst, the difference being 12·0°. A pretty regular decrease of temperature, with an increase of latitude, will be observed, particularly if the places on the west side of the island be regarded as a series by themselves. The temperatures of places on the west are in excess of those of places in the same latitudes, but at some distance from the Atlantic. In winter, the differences between the west and the other parts of the country are still greater. Thus, whilst the January temperature of Falmouth is 44·2°; Guernsey, 43·0°; Ventnor and Barnstaple, 42·0°; Isle of Man, 40·8°; Liverpool, 40·6°; and Greenock, and the whole of the west coast of Scotland as far as Shetland about 39·5°—that of Greenwich is 38·4°; Nottingham, 37·2°; York, 36·7°; Scarborough, 38·3°; Leith, 38·1°; Aberdeen, 37·3°; and Culloden, 37·5°.

The south-west winds are the most prevalent throughout the year, except in April and May, when they give place in a considerable degree to the north-east winds. The notoriously dry and parching character of the latter renders them very deleterious to health. On the other hand, the south-west winds, coming from the Atlantic, are moist and genial, and it is on their greater frequency—being, as compared with the north-east, in the proportion of two to one—that the salubrity of the British climate in a great measure depends.

In those districts of England where hills do not intervene, the annual rainfall is about 25 inches, and in similar parts of Scotland about 28 inches; but these amounts, which may be considered as the rainfalls of the driest districts of the two countries, are variously increased by proximity to hills or rising grounds, according as the place is situated in the east or west of the island, viewed in relation to the direction of the wind which brings the rain, and by its lying on the wind or on the lee side of these hills. Since it is the south-west winds which bring by far the larger proportion of the rainfall, the heaviest falls take place among the hills in the west of the country; and it may be here observed that, in the west, where there are no hills lying to the north-west, west, or south-west, the annual rainfall is only about 40 inches. Except in a few scattered and restricted districts, the amount nowhere rises above 40 inches; but over broad districts in the West Highlands and Skye, and in limited areas in the Lake district, and in North and South Wales, the annual rainfall exceeds 80 inches. At the head of Glencroe, Argyllshire, it rises to 128¼ inches, and at the Stye, Cumberland, to 186 inches. At the Ben Nevis Observatory the amount is 127 inches. Over all districts where the annual rainfall is large, or considerably in excess of the average, the greater proportion falls during the winter months; but on the other hand, where the rainfall is small, as is characteristic of all the great agricultural districts of these islands, the greater proportion falls during the summer months, and there the falls which accompany thunderstorms and east winds occasionally rival the torrential falls of equatorial regions.

Fauna.—The animals found in Britain are for the most part the same as those inhabiting similar latitudes over the whole of the North Temperate or Palæarctic region of the Old World. In fact Wallace says that the majority of genera in countries so far removed as Great Britain and northern Japan are identical. As the British Islands were formerly connected with the Continent, the general similarity is intelligible enough, while the geological changes of insulation and the restriction of area are enough to account for the one great difference that the British, and especially

the Irish species, are much fewer than those on the mainland. Insulation, however, also abets the modification of species, and thus we find a few forms peculiar to Britain, such as the red grouse (*Lagopus scoticus*), a shrew (*Sorex rusticus*), as well as some land-shells and insects. But if we exclude these few exceptions, and take account furthermore of the extinct forms, the general conclusion is simply that the British fauna resembles that of the corresponding parts of the great Palæarctic region. See works by Wallace, Murray, Sclater, Heilprin, &c., cited at GEOGRAPHICAL DISTRIBUTION.

Flora.—The British flora corresponds in a general way to that of the Continent, but appears to consist of several more or less distinct sets. The general resemblance may be shown by the fact that out of 117 plants recorded by De Candolle as characteristic of more than a third of the earth's surface, 100 occur in Britain. As to the various sets, Watson in his *Cybele Britannica* (1847) distinguishes British, English, Scottish, Highland, Germanic, and Atlantic types; while Forbes (*Mem. Geol. Soc.*, i. 336) also considered the vegetation of Britain as composed of outposts of several floras—from France, the Pyrenean region, Scandinavia, and other parts. Watson also distinguishes Agrarian and Arctic zones of distribution in Britain, each with three subdivisions marked by characteristic vegetation. The number of Phanerogams has been computed at 1600 species, and there are probably at least twice as many Cryptogams. Among the very rare flowering plants, *Oxytropis campestris*, *Lychnis alpina*, *Astragalus alpinus*, *Saxifraga cernua*, *Eriocaulon septangulare* may be noted. See Watson and Forbes as above; Loudon's *Catalogue of British Plants* (6th ed. 1867); Balfour's *Manual of Botany* (1871); Turnbull's *Index of British Plants* (after the 'Loudon Catalogue,' 1889); and Hooker's *Student's Flora*.

COMPARATIVE STATISTICS.

AGRICULTURE.—This industry no longer holds the same relative importance as in previous times of our history. It made a great start after the fall of the Stuarts, and its golden epoch was the reign of George II. (1727–60). In 1750 the agricultural wealth (as shown below) was 581 millions sterling, or 53 per cent. of the total wealth of Great Britain, as estimated in 1770 by Young. In 1887 it was under 24 per cent. of the total. If Young's estimates be correct, the number of sheep in 1774 was much greater than at present, and as for tillage, the acres under crops in 1812 (according to Comber) were only 2,000,000 less than at present. The following table shows merely the state of tillage in the three kingdoms during sixty-one years:

Year.	England.	Scotland.	Ireland.	United Kingdom.
1827....	11,140,000	2,550,000	5,450,000	19,140,000 ac.
1846....	13,300,000	3,390,000	5,240,000	21,930,000 "
1866....	13,340,000	3,170,000	5,250,000	21,760,000 "
1876....	13,920,000	3,510,000	5,210,000	22,640,000 "
1888....	13,350,000	3,690,000	4,140,000	21,180,000 "

The distribution of crops in 1888, according to the official reports, was as follows:

	England.	Scotland.	Ireland.	United Kingdom.
	acres.	acres.	acres.	acres.
Wheat	2,510,000	70,000	90,000	2,670,000
Oats	1,885,000	1,015,000	1,280,000	4,180,000
Barley, &c.	2,485,000	255,000	200,000	2,940,000
All Grain	6,880,000	1,340,000	1,570,000	9,790,000
Potatoes	445,000	160,000	805,000	1,410,000
Turnips, Vetches, &c.	2,385,000	500,000	435,000	3,320,000
Clover, &c.	3,640,000	1,690,000	1,330,000	6,660,000
All Crops	13,350,000	3,690,000	4,140,000	21,180,000
Pasture	14,590,000	1,190,000	10,920,000	26,700,000
Total	27,940,000	4,880,000	15,060,000	47,880,000

The cultivated area, as compared with total extent, is 75 per cent. in England, 75 per cent. in Ireland, and only 25 per cent. in Scotland; but the value of products is relatively highest in Scotland, as shown below. In 1887 England and Wales produced 110s. per cultivated acre, Ireland, 72s., Scotland, 163s. Thus, Scotland has only 10 per cent. of the cultivated area of the United kingdom, while the gross product of tillage and pasture reached 40 millions sterling, or 16 per cent. of the total for the three kingdoms. Respecting tillage at past dates the reader is referred to the works of Comber (1812), Middleton (1820), M'Culloch (1831), and Caird, Porter, &c., for detailed statistics. The production of grain has been approximately as follows, in millions of bushels:

Year	Wheat	Barley Oats, &c.	Total	Bushels per Inhabitant.
1830	104	304	408	17
1846	143	258	401	15
1866	98	290	388	14
1876	84	270	354	11
1887	76	235	311	8

From the foregoing table it will be seen that we produce now only 8 bushels of grain per inhabitant, against 17 in the year 1830. At present the average is 19 bushels per inhabitant in France, 15 in Germany, 42 in Denmark, 42 in United States, 34 in Canada, and 18 in Australia.

The following statistics of live-stock are for England and Wales down to 1831, and the United Kingdom afterwards:

Year	Horses.	Cattle.	Sheep.	Pigs.
1688			12,000,000	
1774			25,600,000	
1800			26,150,000	
1831	1,500,000	5,220,000	39,650,000	4,000,000
1867		8,730,000	33,820,000	4,220,000
1877	1,890,000	9,730,000	32,220,000	3,730,000
1888	1,940,000	10,270,000	28,940,000	3,820,000

The returns for 1888 show as follows:

	England.	Scotland.	Ireland.	Unit. Kingd.
Horses	1,240,000	190,000	510,000	1,940,000
Cattle	5,060,000	1,110,000	4,100,000	10,270,000
Sheep	18,580,000	6,730,000	3,630,000	28,940,000
Pigs	2,265,000	155,000	1,400,000	3,820,000

M'Culloch estimated the products of the three kingdoms in 1846 at 218 millions sterling; his table compares with the products of 1887 thus—all farm products, in million pounds sterling:

	1846.			1887.		
	Agricultural.	Pastoral.	Total.	Agricultural.	Pastoral.	Total.
England	80	62	142	92	65	157
Scotland	19	9	28	24	16	40
Ireland	28	20	48	17	37	54
United Kingdom	127	91	218	133	118	251

M'Culloch's estimate for Ireland in 1846 was perhaps too low. The Registrar-general for Ireland in December 1889 published a report on the total value of farming products, thus:

1851-55 annual average	£71,980,000
1866-70 " "	72,240,000
1884-88 " "	54,040,000

This shows a national loss of £18,200,000 per annum to the Irish people, or double the total rental of the country. In seven years, down to August 1888, the Land Court has reduced rents on 243,490 farms from £3,852,000 to £3,094,000, the saving thus effected to tenants being equal to 4 per cent. of their loss by the fall in prices.

Middleton estimated the total value of farm products of England and Wales in 1820 at 127 millions sterling; M'Culloch, in 1846, at 142 millions. In 1887 the total for the three kingdoms was 251 millions—viz.:

	1846. United Kingdom.	1887. United Kingdom.
	England and Wales.	
Crops	£81,500,000	£41,000,000
Grass Crops	28,500,000	52,000,000
Hay and Straw	17,000,000	33,000,000
Meat	26,500,000	51,500,000
Dairy	12,000,000	31,000,000
Eggs and Poultry	1,400,000	10,000,000
Fruit	3,000,000	6,000,000
Hops, Wool, &c.	4,500,000	14,000,000
Timber	1,800,000	1,500,000
Vegetables and Fruits		10,000,000
Total	£141,700,000	£251,000,000

The value of farm products in the three kingdoms in 1846 was 218 millions sterling, equal to 45 per cent. of the then estimated earnings of the whole people. In 1887 it was 251 millions, or only 20 per cent. The above figures merely express the gross product, utterly apart from profits.

The following table of agricultural capital does not include Ireland before 1814. Land is capitalised at thirty times the rental.

Year	Million pounds sterling.			
	Land.	Cattle.	Sundries.	Total.
1750	498	25	58	581
1814	1470	74	172	1716
1843	1677	91	197	1968
1868	2025	170	286	2481
1880	2086	209	295	2590
1887	1873	185	229	2287

In the preceding table an allowance of 10 per cent. is included as 'sundries,' but Chaptal and other French economists allow 14 per cent. It will be noted that the agricultural capital of the United Kingdom has only risen 30 per cent. since 1814, while the wealth of the nation (since Colquhoun's estimate in 1811) has risen 370 per cent. Agriculture, in fact, is by no means so prosperous as it was one hundred years ago, nor is the gross product so high relatively as elsewhere. The agricultural capital of the United States is only 52 per cent. higher than in the United Kingdom (the value of land being in the United States so much less); the gross product is 200 per cent. greater. Germany has the same agricultural capital as the United Kingdom, while her product is 66 per cent. over ours.

The agricultural capital and product of various nations are approximately as follows, in million pounds sterling:

	Capital.	Gross Product yearly.	Per.
United Kingdom	2287	251	10·9
United States	3496	776	21·0
Canada	413	65	15·0
Australia	413	62	15·0
France	3229	450	13·7
Germany	2296	415	17·8
Russia	2090	523	25·0
Argentine Republic	191	44	23·1

FINANCES. The revenue of the British government has been as follows:

Date.	Reign.	Amount.
1080	William I.	£1,450,000
1120	Henry I.	990,000
1250	Henry III.	264,000
1480	Edward IV.	167,000
1540	Henry VIII.	1,300,000
1610	Charles I.	950,000
1700	William III.	4,135,000
1788	George III.	9,030,000
1810	George III.	55,810,000
1830	William IV.	9,400,000
1860	Victoria.	71,100,000
1888	"	89,800,000

In the earlier reigns of the above table the nominal amount was only one-third of the above sums; but it must be remembered that the groat (4 pence) contained as much silver as our shilling of to-day. Hence the above represents the exact value in silver. The purchasing power was three times greater down to 1540 (Henry VIII.), and twice as great from that time till the death of George II. than what our present money can buy.

Revenue and expenditure since 1842 show as follows, in million pounds sterling:

Period.	Revenue.	Expenditure.
1842-51	567	549
1852-61	678	709
1862-71	711	692
1872-81	799	794
1882-88	616	619
47 years	3371	3363

The revenue was made up as follows, in million pounds sterling:

Period.	Customs.	Excise.	Stamps.	Income Tax.	Post Office.	Sundries.	Total.
1842-51	226	151	71	55	18	46	567
1852-61	267	181	78	102	30	20	678
1862-71	221	204	94	78	45	69	711
1872-81	199	268	119	51	74	77	799
1882-88	139	184	83	90	68	52	616
47 years	1022	988	456	396	235	274	3371

The expenditure was as follows, in million pounds sterling:

Period.	Services of Debt.	Army and Navy.	Civil Services.	Total.
1842-51	287	160	102	549
1852-61	285	288	136	709
1862-71	265	263	164	692
1872-81	281	280	233	794
1882-88	196	218	205	619
47 years	1514	1209	840	3363

National expenditure, not including local taxes, compares with the estimated capital wealth of the nation as follows, in million pounds sterling:

Year.	National Wealth.	Total Expenditure.	Rate of Expenditure.
1640	250	1	0·4
1700	790	4	0·5
1810	2130	56	2·6
1840	4100	53	1·3
1860	5560	71	1·3
1888	9400	90	1·0

If we include local taxation, and compare the gross public burden with the estimated earnings of the British and Irish people, we find thus, in million pounds sterling:

Year.	Total Public Expenditure.	Earnings of People.	Rate of Burden.
1840	63	560	11·6 per cent.
1850	68	620	11·0 "
1860	86	760	11·3 "
1870	107	980	10·8 "
1880	143	1170	12·2 "
1888	157	1280	12·3 "

In 1899 the actual revenue was £108,336,193, in addition to about £9,500,000 paid to local taxation in accordance with acts passed between 1888 and

1896. The National Debt, which in 1702 was £12,767,225, was in 1802 £537,653,008; in 1857 it was £837,144,597, and in 1899 £627,562,585, or about £15, 13s. 2d. per head of the population, the annual charge being about 12s. 5d. per head. See NATIONAL DEBT.

COMMERCE.—Official records of British trade (including Irish from 1820) show as follows:

Year.	Reign.	Imports.	Exports.	Total.	Per Inhabitant.
1355	Edward III.	£120,000	£290,000	£410,000	£0 2 10
1573	Elizabeth.	2,100,000	1,880,000	3,980,000	0 15 0
1687	James II.	4,200,000	4,080,000	8,280,000	1 10 2
1726	George I.	6,700,000	7,700,000	14,400,000	1 1s 0
1770	George III.	13,400,000	16,000,000	29,400,000	3 6 0
1800	"	24,100,000	43,200,000	67,300,000	6 8 0
1820	George IV.	29,700,000	44,200,000	73,900,000	3 10 0
1840	Victoria	51,600,000	62,000,000	113,600,000	4 4 0
1850	"	99,000,000	70,000,000	169,000,000	6 4 0
1860	"	210,500,000	164,500,000	375,000,000	12 17 0
1870	"	303,300,000	244,100,000	547,400,000	17 7 0
1880	"	411,200,000	286,400,000	697,600,000	20 5 0
1887	"	362,200,000	280,800,000	643,000,000	17 7 0
1888	"	387,635,743	297,885,236	685,520,979	18 6 2

The Board of Trade returns were as follows for imports:

	1854.	1870.	1887.	Estimate for consumption in 1887.
Grain (including rice and potatoes)	£22,800,000	£36,700,000	£51,200,000	£49,800,000
Raw Cotton	20,200,000	53,500,000	40,200,000	34,500,000
Manufactures	4,100,000	26,500,000	35,400,000	35,400,000
Meat (including live cattle)	3,800,000	7,700,000	22,800,000	22,400,000
Wool	6,500,000	15,800,000	24,500,000	10,700,000
Sugar	10,800,000	17,600,000	16,500,000	15,900,000
Dairy Produce	3,100,000	11,900,000	16,400,000	16,400,000
Tea and Coffee	7,200,000	15,400,000	15,000,000	10,600,000
Timber	11,500,000	13,200,000	12,100,000	12,100,000
Minerals	3,100,000	8,900,000	13,900,000	13,900,000
Wines (including spirits)	6,400,000	8,000,000	7,700,000	6,600,000
Flax and Jute	5,800,000	10,400,000	8,600,000	8,600,000
Raw Silk	6,400,000	8,200,000	2,100,000	2,100,000
Sundries	40,700,000	69,500,000	95,800,000	
Total	£152,400,000	£303,300,000	£362,200,000	

The principal exports of British and Irish products were as follows:

	1854.	1870.	1887.	
Cotton goods	£31,700,000	£71,400,000	£71,000,000	The exports for 1887 show also £59,400,000 of colonial or foreign produce not included here.
Woollen goods	10,700,000	26,600,000	24,600,000	
Linen and Jute goods	5,100,000	10,400,000	8,700,000	
Silken goods	1,200,000	2,600,000	2,800,000	
All Textiles	£48,700,000	£111,000,000	£107,100,000	
Iron	11,700,000	26,500,000	25,800,000	
Other metals	3,800,000	4,700,000	4,300,000	
Cutlery	4,100,000	6,400,000	3,100,000	
Machinery	2,200,000	5,300,000	12,800,000	
Coal	2,100,000	5,600,000	10,200,000	
Sundries	24,600,000	40,100,000	58,100,000	
Total	£97,200,000	£199,600,000	£221,400,000	

The aggregate trade in merchandise only, exclusive of bullion, for seven years ending December 1887 showed thus, in million pounds sterling:

	Imports from	Exports to	Gross Trade, 7 Years	Ratio.
United States	627	254	881	18·6
France	264	180	444	9·4
Holland	174	111	285	6·0
Germany	171	202	373	7·9
Russia	120	53	173	3·6
Belgium	102	97	199	4·2
Sweden and Norway	76	35	111	2·3
Spain	71	31	102	2·2
Turkey	33	48	81	1·7
Italy	22	54	76	1·6
Denmark	36	17	53	1·1
China and Japan	69	57	126	2·7
Egypt	61	22	83	1·8
Brazil	37	46	83	1·8
River Plate	14	46	60	1·2
Chili	19	15	34	0·7
Portugal	21	17	38	0·8
Java	22	13	35	0·7
Other Countries	135	121	256	5·3
Foreign Countries	2074	1419	3493	73·6
India	241	223	464	9·8
Australia	173	181	354	7·5
Canada	75	66	141	3·0
West Indies	32	22	54	1·2
South Africa	38	39	77	1·6
Other Colonies	77	75	152	3·3
British Colonies	636	606	1242	26·4
Grand Total	2710	2025	4735	100·0

Shipping.—The merchant shipping of the British empire, colonies included, showed as follows:

Year.	Vessels	Tons.	Sailors.	Tons per Vessel.	Tons per Sailor.	Reign.
1588	470	37,400	..	80	..	Elizabeth.
1610	910	83,000	.	90	..	James I.
1666	1,320	120,000	..	90	..	Charles II.
1688	2,620	210,000	.	80	..	James II.
1702	3,260	261,000	.	80	.	Anne.
1760	5,730	487,000	.	85	.	George III.
1800	17,410	1,856,000	140,000	106	14	"
1810	23,703	2,426,000	162,000	102	15	"
1820	25,374	2,654,000	175,000	105	15	George IV.
1830	23,721	2,533,000	155,000	107	16	William IV.
1840	28,962	3,311,000	201,000	114	17	Victoria.
1850	34,288	4,233,000	239,000	124	18	"
1860	29,469	5,713,000	230,000	193	25	"
1870	32,920	7,150,000	261,000	216	27	"
1881	30,531	8,535,000	270,000	280	31	"
1887	28,212	8,936,000	280,000	320	32	"

The shipping of the United Kingdom, excluding colonial, has been as follows:

Year.	Vessels.	Tons.	Seamen.	Tons per Vessel.	Tons per Seamen.
1810	20,253	2,211,000	145,000	105	15
1830	19,174	2,202,000	131,000	114	17
1850	25,084	3,565,000	148,000	138	24
1870	26,367	5,691,000	196,000	215	29
1881	24,830	6,490,000	193,000	260	33
1887	22,136	7,340,000	203,000	334	36

The following table shows the ratio of British and Colonial tonnage in the world's shipping:

Year.	British and Colonial Flags.	Various Flags.	The World.	British Ratio.
	Tons.	Tons.	Tons.	
1820	2,654,000	3,900,000	6,554,000	40 per cent.
1842	3,311,000	6,200,000	9,511,000	35 "
1860	5,713,000	7,973,000	13,686,000	42 "
1870	7,150,000	8,426,000	15,576,000	46 "
1881	8,535,000	11,111,000	20,646,000	41 "
1887	8,936,000	12,966,000	21,902,000	42 "

In the foregoing tables no distinction is made between steam and sailing tonnage. A steamer, however, is found to make three ocean voyages or six short trips in the same time that a sailing vessel takes for one; we must therefore multiply steam tonnage at least by four, to arrive at the carrying-power. The following table makes this allowance, and under the head of Effective Carrying power it will be observed that the shipping of the British empire has multiplied six and a half times since 1840. Reference to American statistics shows that in the same interval the sea-going shipping of the United States increased in nominal tonnage only 200,000 tons, or 25 per cent.

Year.	Steam (nominal tonnage).		Sailing (nominal tonnage).		Effective Carrying power.	
	British.	Other Flags.	British.	Other Flags.	British.	Other Flags.
1840	95,000	21,000	3,216,000	6,180,000	3,596,000	6,264,000
1850	188,000	204,000	4,045,000	6,800,000	4,797,000	7,616,000
1860	502,000	318,000	5,211,000	7,655,000	7,219,000	8,927,000
1870	1,203,000	715,000	5,947,000	7,711,000	10,759,000	10,571,000
1881	3,105,000	2,539,000	5,430,000	9,572,000	17,850,000	19,728,000
1887	4,355,000	3,877,000	4,581,000	9,089,000	22,005,000	24,515,000

The carrying-power of the British merchant navy (including colonial) in 1887 was 22,000,000 tons, or considerably more than the total carrying-power of the world (21,300,000 tons) in 1870, since which year the British merchant shipping has doubled. It is now almost equal to the total effective tonnage of all other nations in the aggregate. The above table gives the following result:

	Carrying power.			Ratio.		
	1840	1860	1887	1840	1860	1887
	Tons.	Tons.	Tons.			
British	3,596,000	7,219,000	22,005,000	36·5	44·6	47·3
Other flags	6,264,000	8,927,000	24,515,000	63·5	55·4	52·7
The world	9,860,000	16,146,000	46,520,000	100·0	100·0	100·0

In the above table British includes colonial shipping. If we compare the merchant shipping of the United Kingdom only with that of other flags we find:

Year 1887.	Nominal Tonnage.	Carrying-power. Tons.	Ratio.
United Kingdom	7,340,000	19,590,000	42·0
United States	4,130,000	8,300,000	17·8
Germany	1,285,000	2,640,000	5·7
Norway	1,524,000	1,860,000	4·0
Canada	1,078,000	1,310,000	2·8
Russia	1,025,000	1,395,000	3·0
France	993,000	2,495,000	5·4
Italy	946,000	1,380,000	3·0
Spain	594,000	1,040,000	2·2
Sweden	517,000	890,000	1·9
Austria	349,000	770,000	1·6
Holland	286,000	610,000	1·3
Denmark	274,000	550,000	1·2
Austria	262,000	530,000	1·2
Greece	262,000	370,000	0·8
South America	75,000	490,000	1·0
Other Countries	785,000	1,720,000	3·8
The world	21,902,000	46,520,000	100·0

WEALTH.—Comparing Porter's table for 1840 with the estimates for 1860 and 1887, we find as follows, in million pounds sterling:

	1840	1860	1887
Railways	21	348	831
Houses	770	1164	2640
Furniture	385	582	1320
Lands	1680	1748	1560
Cattle, &c.	280	350	414
Shipping	23	44	130
Merchandise	70	150	321
Bullion	61	105	143
Sundries	810	827	1869
Total	4100	5368	9228

In the above table land in 1887 is put down at 1560 millions, whereas the official valuation at thirty years' purchase, as already shown under the item agriculture, is 1873 millions; but it is generally admitted that the official valuation is twenty per cent. over the real value.

The increase of wealth from 1840 to 1887 was 124 per cent., or three times greater than that of population. The annual accumulation averaged 64 millions sterling between 1840 and 1860, and 143 millions between the latter year and 1887. Wilson estimated the accumulation in 1840–45 at 60 millions yearly; Giffen, in 1880, at 150 millions. *Houses* constitute the largest item of public wealth—viz. 2640 millions sterling, the value being taken at twenty times the assessed annual rental. In this item alone we see an increase of 1870 millions since 1840, the number of new houses built between that year and 1880 being 2,218,000—say 55,000 yearly. It is probable that new houses represent only one-third of the increase of value, as the old ones (4,430,000) have likewise risen. Allowing for houses built since 1880, the number and value would be approximately thus:

	No.	Value, millions £s.	Per house £
Built before 1840	4,400,000	1730	393
Since 1840	2,700,000	910	340
Total in 1889	7,100,000	2640	372

The value of house-property per inhabitant varies in the three kingdoms:

	£ per inhab.		£ per inhab.
England	77	London	176
Scotland	62	Liverpool	114
Ireland	12	Glasgow	100
United Kingdom	71	Dublin	44

The value of house-property for the whole United Kingdom in 1840 was only £30 per inhabitant.

Furniture, according to insurance agents, averages half the value of houses; this item includes, moreover, pictures, clothing, jewelry, and carriages.

Lands. The value under this head has been explained already under Agricultural Statistics.

Railways are the fourth item of national wealth, the above statement of capital employed being from official returns. Since 1860 nearly 20 millions yearly have been thus invested in the three kingdoms, of course excluding similar investments abroad, which are comprised under Sundries.

Shipping.—The United Kingdom has 22,200 vessels, aggregate 7,400,000 tons, which, at the medium valuation of £17, 10s. per ton, makes 130 millions sterling. Over 3 millions yearly go into new merchant-vessels built in the three kingdoms.

Merchandise. We assume six months' imports and exports to represent at each of the above dates the value of merchandise on hand. It is probably under the reality.

Sundries were estimated in 1887 as follows :

	Million £s.
Canals, docks, dockyards, and navy	115
Gas, water-works, telegraphs	178
Colonial loans and railways	432
Australian mortgages	330
Foreign stocks	814
Total	1869

The amount of British capital in foreign stocks is variously estimated.

Bullion.—This is not properly wealth, but a token of it. However, in deference to vulgar prejudice, we include the estimated amount of gold and silver at different dates.

According to the Probate returns for 1881-85 the wealth held by the inhabitants of the United Kingdom would then have been only 8200 millions sterling. It must, however, be observed that estates under £100 escape the Probate Court, and many large estates are under-valued in proving succession; also, that the royal navy, dockyards, prisons, lighthouses, high-roads, &c. have to be added to the Probate estimates, which will bring us up to the total of 9228, as first stated.

RELIGION.—The census takes no note of religion except in Ireland, but the ratios of marriages in the different churches enable us to form a close estimate of the adherents to the various creeds in England and Scotland. On the basis of the census of 1881 the figures would stand thus :

	Numbers.			Percentage.			
	England.	Scotland.	Ireland.	England.	Scotland.	Ireland.	United Kingdom.
Church of England	18,798,000	99,000	636,000	72·3	2·7	12·3	55·8
Roman Catholic	1,066,000	318,000	3,952,000	4·1	8·6	77·1	15·2
Presbyterian	114,000	2,997,000	486,000	0·4	81·0	9·4	10·3
Methodist, &c.	5,990,000	281,000	48,000	23·2	7·7	0·9	18·7
Total	25,968,000	3,695,000	5,122,000	100·0	100·0	100·0	100·0

The Established Church, before the disestablishment in Ireland in 1869, comprised the following livings :

Nominated by	England.	Ireland.	Total.
Crown	952	131	1,083
Noblemen	5,096	340	5,436
Bishops, &c.	4,694	924	5,618
Total	10,742	1395	12,137

A report, published in 1880, on the income of the Established Church in England and Wales, was as follows :

Tithes	£4,054,000
Committee grants	776,000
Other sources	973,000
Total	£5,803,000

The above, however, included £962,000 of tithes that go to laymen, the real Church income being £4,841,000, distributed thus :

Clergy.	No.	Income.	Per Head.
Bishops	33	£168,000	£5100
Canons	166	240,000	1440
Rectors	11,780	3,830,000	330
Curates	5,050	603,000	120
Total	17,029	4,841,000	

The above does not include the 'offertory,' which has been found to range from £100 to £240 per annum in each church, and is estimated to sum up £2,200,000 yearly, at £120 per church. The Ecclesiastical Report for 1880 shows that in forty years the commissioners have expended 22½ millions in creating new endowments to an annual value of £746,000 in aid of 4700 distressed parishes —say £160 each. The commissioners distribute about £700,000 a year in creating new benefices, to an average amount of £23,000 per annum. Balance still in hand, £8,200,000. The above tables do not include collegiate endowments, worth £550,000 a year. Total clergy of Church of England 19,000, including 2000 schoolmasters. The Church of England has, moreover, 232 clergymen in Scotland, 820 in Ireland, and 2700 in colonies and foreign countries, making a grand total of 22,752.

The number of churches of all persuasions in England and Wales in 1883 was as follows :

Church of England	14,573
Methodist	11,514
Independent	2,603
Baptist	2,243
Calvinist	895
Roman Catholic	824
Quaker	375
Presbyterian	291
Jewish	60
Various	2,628
Total	35,916

In the above are not included 364 Roman Catholic chapels attached to religious houses, possessing no marriage license.

The condition of the Anglican Church in Ireland in 1880 was as follows :

Number of clergy	820
Number of laity	635,100
Endowment	£130,000
Donations	118,000
Total income	248,000
Endowed capital	3,260,000

There are twelve bishops, who receive £41,500 per annum—average £3600 each. In November 1880 the residue of property formerly belonging to the Anglican Church in Ireland was valued at 12 millions, producing a revenue of £574,000, to be devoted to purposes of general utility or beneficence.

The condition of the Roman Catholic Church in the British empire in 1882 was as follows :

	Bishops.	Priests.	Churches.	Laity.
England	15	2112	1188	1,066,000
Scotland	6	366	295	318,000
Ireland	28	3290	2760	3,952,000
Canada	24	1210	1050	2,150,000
Australia	16	376	787	584,000
India	22	1179	700	1,318,000
Other colonies	20	315	240	466,000
Total	131	8788	7020	9,854,000

The average income in the United Kingdom is £400 for a bishop, and £80 for a priest. In India it is £260 per bishop, and £36 per priest. In Canada and Australia it is higher than in England.

There are 51,000 Jews in the United Kingdom.

MANUFACTURES.—M'Pherson's table of British manufactures in 1782 compares with the estimates for 1882 (United Kingdom) as follows :

	1882		Per cent.	
			1782.	1882
Cotton goods	£260,000	£95,200,000	1·7	11·6
Woollen "	16,800,000	46,400,000	29·5	5·5
Linen "	1,750,000	11,770,000	3·1	1·4
Silk "	3,250,000	7,240,000	5·9	0·9
Leather	10,500,000	34,050,000	18·4	4·2
Iron and steel	12,100,000	127,000,000	21·4	15·4
Sundries	11,200,000	496,670,000	20·0	61·0
Total.....	£56,660,000	£818,300,000	100·0	100·0

The growth of the principal manufactures is shown as follows—value in million pounds sterling:

	1850.	1859	1869	1870	1881
Cottons	31	43	78	94	95
Woollens	23	29	38	55	46
Linen, &c.	9	17	17	18	21
Silks	8	10	18	16	7
Sundries	7	10	17	22	26
Textiles	78	109	168	215	195
Hardware	31	42	65	82	127
Textiles and Hardware	109	151	233	297	322

The preceding tables were prepared by Mr Mulhall from the materials of his *Dictionary of Statistics* (enlarged edition, 1891).

One rather unsatisfactory aspect of British manufacture in recent years has been the extent to which German goods have superseded, both in the United Kingdom and abroad, those of British make. The facts are thus summed up in E. G. Williams's *Made in Germany* (1896). While in twenty three years our population has increased by over 7,000,000, the declared value of our exports has fallen by over £30,000,000 a year. In 1883–93, while British exports were declining, the value of German manufactured goods imported into this country increased by £5,000,000 a year. In the same years, 1883–93, our imports of manufactured goods increased by £30,000,000, while the total value of our exports declined by £22,000,000. In iron and steel and in textiles, German goods are superseding British goods in the United States, some British colonies, and many markets where British commerce was formerly supreme.

POPULATION.—The following table shows the population of the United Kingdom at various dates since the first census that of 1801, in which Wales is given along with England. The counties, with their areas (in acres) and populations, are given for each of the main divisions of the empire under ENGLAND, SCOTLAND, IRELAND, and under their own heads.

	Area in acres.	1801.	1841.	1891.
England	40,823	8,892,536	15,002,443	27,483,490
Wales	7,363		911,705	1,519,035
Scotland	29,820	1,608,420	2,620,184	4,025,627
Ireland	32,574	5,395,456	8,196,597	1,704,750
Isle of Man	220		47,975	55,608
Channel Islands	75		76,065	92,234
Army, Navy, &c.			292,954	224,211
Total, Unit. Kingd.	120,832		27,057,923	38,104,175

At the census of 1881 the population was 35,241,482; in 1895 it was calculated at 39,134,166. In 1890–91 (not to mention those in the colonies, &c.) there were 3,122,911 natives of the United Kingdom in the United States, 39,687 in France, and 15,534 in Germany. In 1891 there were in England and Wales 282,271 natives of Scotland (253,528 in 1881), 458,315 natives of Ireland (562,374 in 1881), and 198,113 natives of foreign states, 50,599 (as against 37,301 in 1881) being Germans, 20,797 (as against 14,596) French, and 19,740 (as against 17,767) American citizens.

COLONIES.—The British colonial empire comprises some fifty distinct governments, and, including India, extends over nearly 10 millions of square miles—more than eighty times the area of the mother-country, or one-sixth of the habitable land-surface of the globe. The colonies and dependencies have a population of near 250½ millions as compared with the 40 millions in the mother-country. Of this, nearly 10,000,000 square miles belong to the nine self-governing colonies, with a population of over 10,000,000.

The following table shows the area and population of the colonies and dependencies of the empire. The populations are given according to the census of 1891 or later official estimates:

	Area in sq. miles.	Population.
India (British)	868,314	221,172,952
Straits Settlements	1,472	512,342
Ceylon	25,365	3,008,466
Mauritius	713	371,656
Labuan and British Borneo	30,000	175,853
Hong kong	30·5	221,441
Australia	2,944,628	2,051,003
Tasmania	26,215	146,667
New Zealand	104,458	626,658
Fiji	7,740	121,180
Falkland Isles	6,500	1,789
Natal	18,750	543,913
Cape of Good Hope	213,917	1,527,224
St Helena	47	4,116
Lagos	1,060	100,000
Gold Coast	29,401	1,475,882
Sierra Leone	3,000	180,000
Gambia	69	14,266
Canada	3,466,542	4,891,264
Newfoundland	42,000	202,040
Bermudas	19	15,319
Honduras	6,400	31,371
Bahamas	4,466	47,565
Turk's Islands	169	4,745
Jamaica	4,193	639,491
Windward Islands	784	140,777
Leeward Islands	666	127,723
Trinidad	1,754	208,068
British Guiana	109,000	278,295
Gibraltar	1	20,050
Malta	119	168,105
British New Guinea	90,000	350,000

The above figures do not include the tendatory states of India (595,167 miles: pop. (1891) 66,050,479), Nigeria, the Transvaal and Orange River Colonies, or Egypt and the Egyptian Soudan. Innumerable other subjects bearing on the resources, history, administration, &c. of the United Kingdom will be found under such heads as:

Agriculture.	England, Church of.	Parish.
Army.	English Language.	Parliament.
Banks.	" Literature.	Police.
Bridges.	Equity.	Poor Laws.
Canals.	Fisheries.	Post-office.
Chancery.	Friendly Societies.	Railways.
Coal.	Gaelic.	Religion.
Colony.	Harbour.	Savings Banks.
Common Law.	Immigration.	Scotland.
Cotton.	Ireland.	Shipbuilding.
County.	Iron.	Tax.
Criminal Law.	Land.	Telegraph.
Dialect.	Lighthouse.	Trade Unions.
Docks.	Local Government.	Universities.
Education.	National Debt.	Volunteers.
Emigration.	Navy.	Wales.
England.	Ordnance Survey.	Wool.

For the arms of Great Britain and Ireland, see FLAG, HERALDRY. The history is dealt with under ENGLAND, SCOTLAND, IRELAND, and WALES. See the works there cited; also:

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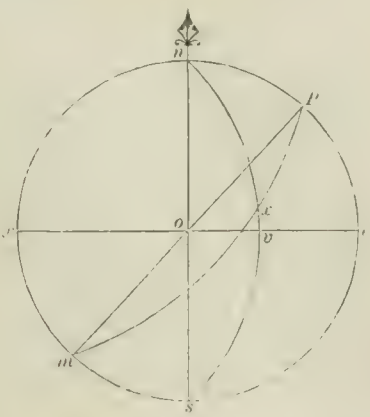
Great Circle or **Tangent Sailing.** In order to have a clear idea of the advantages of great circle sailing it is necessary to remember that the shortest distance between two places on the earth's surface is along an arc of a great circle (see SPHERE); for instance, the shortest distance between two places in the same latitude is not along the parallel of latitude, but along an arc of a circle whose plane would pass through the two places and the centre of the earth. The object, then, of great circle sailing is to determine what the course of a ship must be in order that it may coincide with a great circle of the earth, and thus render the distance sailed over the least possible. This problem may be solved in various ways. The handiest practical solution is to stretch a string over a terrestrial globe quite tight between the ports of departure and arrival. The string will lie on the great circle required. A few spots on the track of the string should be transferred to the ordinary navigating (i.e. Mercator's) chart, a free curve should be drawn through these transferred spots, and the ship should be kept as close to that curve as possible. The solution by computation is simply the calculation of sides and angles in a spherical triangle. The method by computation will be understood from the accompanying diagram, where *ns* are the poles of the



earth, *ev* the equator: *nmse* represents a meridian which passes through the place *p*, *nxvs* another meridian through the place *x*, and *pxm* a portion of a great circle; let *p* be the place sailed *from*, and *x* the place sailed *to*, then *px* is the great circle track, and it is required to determine the length of *px* (called the distance), and the angles *npx*, *nxp*, which are equal to the first and last true courses. To determine these we have three things given: *nx*, the co-latitude of *x*; *np*, the co-latitude of *p*; and the angle *xnp*, which, measured along *ve*, gives the difference of longitude. The problem thus becomes a simple case of spherical trigonometry, the way of solving which will be found in any of the ordinary treatises on the subject of Spherical Trigonometry.

Next, several longitudes on the route, say at 5 intervals, are chosen, and the co-latitudes of the spots on the great circle which correspond to these assumed longitudes are calculated. The latitude and longitude of these spots on the great circle being now obtained, the courses and distances from one to the other in succession can be found by the ordinary processes of navigation. The work is somewhat shortened by finding that particular spot on the entire great circle which lies farthest from the equator. It is called the vertex, and is easily found by the property that the meridian running through it is at right angles to the great circle at that spot. To avoid these, or some of these somewhat troublesome calculations, charts have been constructed on projections different from that of Mercator. On one of these, called the Gnomonic Projection, all the great circles are straight lines; on another, all the great circles are true circles. It has also been suggested that the ports of departure and arrival being given, and the *vertex* (described above) having been found, and all three having been marked on a Mercator's chart, a true circle drawn through these three spots will be near enough to the great circle for practical purposes. A modification of this approximate method is useful in the run between the Cape of Good Hope and Australia, on which the great circle route goes too far into the southern ice-region. If a spot of highest safe south latitude be here substituted for the latitude of the vertex, a circle drawn through the places of departure, of arrival, and of the substituted safe vertex will give what is called a *composite* great circle.

From the theory of great circle sailing the following most prominent features are at once deduced: *A ship sailing on a great circle makes direct for her port, and crosses the meridians at an angle which is always varying*, whereas, by other sailings, *the ship crosses all meridians at the same angle*, or, in nautical phrase, *her head is kept on the same point of the compass, and she never steers for the port direct till it is in sight, except in the two cases where the ordinary track lies* (1) *on a meridian*, or (2) *on the equator*. As Mercator's Chart (see MAP) is the one used by navigators, and on it the course by the ordinary sailings is laid down as a straight line, it follows, from the previous observations, that the great circle track must be represented by a curve, and a little consideration will show that the latter must always lie in a higher latitude than the former. If the track is in the northern hemisphere it trends towards the north pole; if in the southern hemisphere it trends towards the south pole. This explains how a curve-line on the Mercator's chart represents a shorter track between two places than a straight line does; for the difference of latitude is the same for both tracks, and the great circle has the advantage of the shorter degrees of longitude measured on the higher circles of latitude. Consequently, the higher the latitude is the more do the tracks differ, especially if the two places are nearly on the same parallel. The *point of maximum separation*, as it may be called, is that point in the great circle which is farthest from the rhumb-line on Mercator's chart. Since the errors of dead reckoning, or even of dead reckoning

supplemented by astronomical observation, prevent a ship from being kept for any length of time with certainty on a prescribed track, and thus may necessitate the calculation from time to time of a new path, in practice the accurate projection of a great circle track on the chart would be a waste of time. Some ignorantly object to great circle sailing on the ground that, on account of constant change of the course steered, a ship cannot be kept with absolute precision on the correct great circle track. But, in fact, all that is required of a navigator is to sail as near to his great circle track as convenient; and each separate course will be approximately a tangent to his track, and the shorter these tangents are made the more will the length of a voyage be diminished.

Great Eastern. This great ship, the largest piece of marine architecture ever put together, was planned (1852) by Brunel and Scott Russell at the instance of the Eastern Steam-navigation Company, a vessel being wanted for the route to Australia round the Cape which could carry enough coal for the voyage out and home, and have besides space for a large number of passengers and cargo. The scheme was for a ship that would accommodate 1000 passengers, 5000 tons of goods, and 15,000 tons of coal. As at first arranged for, the measurements were: length, 680 feet between perpendiculars, or 692 feet upper deck; breadth, 83 feet, or 118 over paddle-boxes; height of hull, 60 feet, or 70 to top of bulwarks. Ten partitions of plate crosswise of the ship divided the interior into 11 watertight compartments, further subdivided by longitudinal partitions. The propelling power comprised both paddle and screw. The 4 paddle-engines had 4 boilers; the 4 screw-engines had 6 boilers. The smoke from the furnaces ascended 5 funnels, 100 feet high by 6 in diameter. Setting aside the nominal power, all the 8 engines at full force were estimated to work up to 11,000 horse-power. There were 6 masts, 5 of them iron. The vast wall-sided compartments of the ship had facilities for conversion into cabins for 800 saloon passengers, 2000 second-class, 1200 third-class, and 400 officers and crew; or 5000 might have been accommodated in all if emigrants or troops. The height of the 'tween decks was 13 feet. Such were the plans for the mighty ship, which were never fully carried out in all their details, owing to numerous alterations and refittings.

During 1854–57 the operations proceeded at Millwall, in spite of frequent and heavy financial difficulties. By November 1857 the ship had advanced to the launching condition; but it required various attempts, between November 3, 1857, and January 31, 1858, and an expenditure of £60,000, to effect the launching. During 1858 and 1859 the works continued as fast as the company could supply money; and altogether the vessel was estimated to have cost £732,000. Uncertain how far the original intention of a trade to and from Australia could be realised, the directors determined on a trial trip across the Atlantic. It was a disaster. The ship left the Thames, September 8, 1859; an explosion of steam-pipes took place off Hastings; seven persons were killed and several wounded; and the voyage abruptly came to an end at Portland. The ship started again on June 17, 1860, from Southampton, crossed the Atlantic in eleven days, and reached New York on the 28th. During the remainder of 1860 and the greater part of 1861 she made many voyages to and fro, including the conveyance of Foot Guards to Canada, losing money by the insufficiency of the receipts to meet the current expenses, and constantly requiring repairs. For the arrangement and services of the ship in 1865 and 1866 in paying out the Atlantic cable, see ATLANTIC TELEGRAPH. In 1867 she was chartered to bring passengers from New York to Havre in connection with the Paris International Exhibition, but the scheme proved a failure. From 1869 onwards the *Great Eastern* successfully laid some of the most important telegraph cables—across the Atlantic, in the Mediterranean, Red Sea, &c. After acting as a coal-hulk at Gibraltar in 1884, the gigantic vessel was sold in London by auction for £26,200. Finally, after having been used for a time as a 'show' ship, she was sold by auction at Liverpool in November 1888, to be broken up, the five days' auction fetching £58,000.

Great Fish River, (1) in Cape Colony, rises in the Sneeuwberg Mountains, and, after a generally south-easterly course of 230 miles, enters the Indian Ocean in 33° 25′ S. lat. and 27° E. long. The Midland Railway which connects Port Elizabeth and Port Alfred with Kimberley skirts part of the river; there is an iron bridge at Cradock, and Fish River Station is 207 miles from Port Elizabeth.—(2) Great Fish River, or Back's River, in North America, enters an inlet of the Arctic Ocean in 95° W. long., after passing through Lake Pelly. Sir George Back (q.v.) traced its course to the ocean.

Great Grimsby. See GRIMSBY.

Great Kanawha (pronounced *Kanaw'wa*), an affluent of the Ohio River, is called New River in the upper part of its course, and rises in the Blue Ridge of North Carolina. It has a course of 450 miles, and is navigable to a fall 30 miles above Charleston, and about 100 miles from its mouth.

Great Marlow. See MARLOW.

Greatrakes, VALENTINE (sometimes called *Greatorex* and *Greatarick*), the 'touch doctor,' was born at Affane, near Lismore, in County Waterford, 14th February 1629. During the troubles of the Rebellion his mother fled in 1641 to England, and settled in Devonshire. From 1649 till 1656 he served as an officer in the Parliamentary army, and from 1656 till the Restoration he acted as a magistrate in his native place. About 1661 he began 'touching' for the king's evil, in obedience, he said, to a divine impulse, and ere long he touched or 'stroked' for ague and for all manner of disease. He was summoned to the king at Whitehall; multitudes flocked to him, and his cures were witnessed and attested by men so eminent as Robert Boyle, Ralph Cudworth, and Henry More. This predecessor of Mesmer did not profess to be always successful; but his claims provoked much controversy, and in 1666 he published in his own defence his *Brief Account* of himself and his cures. He died at Affane, 28th November 1683.

Great Salt Lake, in Utah, stretches along the western base of the Wahsatch Mountains, about 4200 feet above the sea, forming a principal drainage centre of the Great Basin (q.v.). Well-marked shore-lines on the mountains around, reaching 1000 feet higher than the present level, show that the lake had formerly a vastly greater extent; this prehistoric sea has been named Lake Bonneville. Great Salt Lake is over 80 miles long and from 20 to 32 broad, but for the most part exceedingly shallow. It contains several islands, the largest, Antelope Island, about 18 miles long. Its tributaries are the Bear, Ogden, Jordan, and Weber, the Jordan bringing the fresh waters of Lake Utah; but Great Salt Lake has no outlet save evaporation, and its clear water consequently holds at all times a considerable quantity of saline matter in solution; in 1850 the proportion was 22·4 per cent., in 1869 it was only 14·8. Between these dates the annual tribute exceeded the evaporation, and the area of the lake increased from 1700 to 2360 sq. m.; more recently, it has again been slowly receding. Several species of insects and a brine-shrimp have been found in its waters, but no fishes; large flocks

of water-fowls frequent the shores. The first mention of Great Salt Lake was by the Franciscan friar Escalante in 1776, but it was first explored and described in 1843 by Fremont; for the value of Baron La Hontan's fables, see H. H. Bancroft's *Utah* (San Francisco, 1889). A thorough survey was made in 1849–50 by Captain Howard Stansbury, U.S.A. See SALT LAKE CITY, and UTAH.

Great Seal of England. See SEAL.

Great Slave Lake lies in the Canadian North-west Territory (62° N. lat.). Its greatest length is about 300 miles, and its greatest breadth 50 miles. By the Slave River it receives the surplus waters of Lake Athabasca; and it discharges by the Mackenzie River into the Arctic Ocean. See ATHABASCA.

Great Wall of China. See CHINA, Vol. III. p. 185.

Greaves. See ARMOUR.

Grebe (*Podiceps*), a genus of diving birds (Pygopodes), usually frequenting rivers and fresh-water lakes, and visiting the sea only when migrating or in winter. The foot of the grebe is broad and flattened; the toes lobed and bearing separate membranes united only at the base; the wings are short and rounded; and there is virtually no tail. The legs are placed so far back that the bird stands erect like the penguins. Its movements on land are ungainly in the extreme, but it swims gracefully, and is the most expert of divers, not using its wings, but propelling itself on its downward career solely by the aid of its paddle-like feet. The grebe seldom leaves the water, and can even swim under the surface for a considerable distance, threading its way with wonderful expertness among the stalks and leaves of aquatic plants. A floating nest is built of leaves and twigs and moored to reeds or grasses. The eggs are covered with a chalky incrustation, and are so wide in the middle as to look almost biconical. The mother-bird, before leaving the nest, scratches the weeds over them with her feet, so that the whole looks like a tangled mass of rubbish. She is careful of her young, carrying them on her back, and even diving with one under her wing. The grebe feeds chiefly on crustaceans, frogs, and small fishes, partly, however, on vegetable food. The plumage varies at different seasons.

The Great Crested Grebe (*P. cristatus*) is found

Great Crested Grebe (*Podiceps cristatus*) and Nest.

all the year round on inland lakes in England and Ireland, more rarely in Scotland, and at the sea-coast in winter when driven by frost from the lakes. The adult male is 22 inches in length, and is very conspicuous in flying because of the glossy whiteness of the plumage on the ventral surface; the female is smaller and has a less developed crest. The best-known British species is the Little Grebe or Dabchick (*P. fluviatilis*), one of our most beautiful river-birds, which is widely distributed throughout England and Ireland, and is also found in Scotland, where it breeds at an elevation of 2000 feet. In summer the head, neck, and upper parts are dark brown, the under parts grayish-white; in winter the colours are paler. Gould describes the young dabchicks as having 'delicate rose-coloured bills, harlequin-like markings, and rosy-white aprons.' The adult bird only reaches a length of 9 to 10 inches. The Red-necked Grebe (*P. griseigena*) and the Slavonian or Horned Grebe (*P. auritus*) visit our shores in autumn and winter, and the Black-necked or Eared Grebe (*P. nigricollis*) in spring and summer. An allied genus, Podilymbus, comprising two species, is confined to North and South America. The grebes are much sought after for their plumage, but their shyness and their great agility in diving and swimming under water render them extremely difficult to shoot. So easily alarmed are they that Mr Ruskin, in his somewhat revolutionary treatment of ornithological nomenclature, proposed to rename the genus Trepida. The skin of the grebes is made into muffs or cut into strips for trimmings, the beautiful, satiny plumage on the lower parts of the body of the Great Crested Grebe being in particular request for these purposes. See Howard Saunders, *Manual of British Birds;* and Ruskin, *Love's Meinie.*

Grecian Architecture. See GREEK ARCHITECTURE.

Greece is the easternmost of the three peninsulas projected southwards by Europe into the Mediterranean; and being for the most part limestone, is a continuation of the great mountain-system which stretches from Spain to Syria, encloses the basin of the Mediterranean with precipitous edges, and shuts off the three peninsulas from the continent. In no other country has the geography more influenced the history than in Greece; and the tendencies of this influence are expressed on the one hand in Wordsworth's lines:

> Two Voices are there; one is of the Sea,
> One of the Mountains; each a mighty Voice:
> In both from age to age thou didst rejoice,
> They were thy chosen music, Liberty!

and on the other in Hegel's dictum: 'Mountains alone divide, seas unite.' Thus, as the west coast of Greece is mountainous and harbourless, whilst the east is full of bays, gulfs, and havens, Greece turned her back on Italy, and was brought into intimate communication with Asia Minor. The easternmost of the three basins into which the Mediterranean is divided became a Greek lake. The greatest factor in Greek unity was the Ægean Sea, for it united the Greeks of the mother-country with the Greeks of the isles and of the coast of Asia Minor. At the same time, as the coast is the first part of a new country to become civilised, and Greece has relatively a longer coast-line than any other country in Europe, just as Europe has more coast than any other quarter of the globe, the history of European civilisation begins with Greece. On the other hand, the spirit of liberty, which nerved the Greeks to resist the Persians, and so save the civilisation of the world, was due to the mountains of Greece; but the divisions between the Greeks themselves were also due to the mountains, which divided the land into cantons incapable of effectual combination against the Macedonian invader who conquered them all.

Let us then begin with the mountains, and, so to speak, articulate the skeleton of Greece. The range which in the north cuts off the peninsula from

the continent of Europe is an extension of the Balkans. From it run chains from north to south, or rather from north north west to south-south-east, which form the skeleton of Greece. The most important of these is the range which forms the backbone of the country, separating first Illyria on the west from Macedonia on the east, and then Epirus on the west from Thessaly on the east. Thus the western boundary of Thessaly is formed by Pindus (7111 feet), the main offshoot of the Balkans. The eastern boundary is also marked not only by the sea, but by important mountains derived from the Balkan system. These are Olympus (9750 feet), Ossa, Mavrovuni, and Pelion. Returning to Pindus, we find that its tendency to the east becomes now more pronounced, and a branch of it, under the name of Othrys, starting from the mighty Tymphrestus (mod. *Velukhi*, 7606 feet), forms the south boundary of Thessaly. It then is continued in the celebrated mountains Parnassus (8036 feet) and Helicon, forms the land of Attica, and reappears as the islands of Ceos, Cythnos, Seriphos, and Siphnos. The subsequent course of that branch of the Balkans which we have mentioned as marking in part the eastern boundary of Thessaly is equally interesting, for it forms first the island of Eubœa, and then the isles of Andros, Tenos, Myconus, Naxos, and Amorgos. The Peloponnese, 'the island of Pelops,' or by its modern name the Morea, is connected with northern Greece merely by the narrow isthmus of Corinth, and is separated from it by the long if narrow Gulf of Corinth on the west and the Saronic Gulf on the east. The commercial supremacy of ancient Corinth, standing as it did on 'two bright havens,' and on the road from Peloponnese to the mainland, was due to its position: and we need only add, in further explanation, that all the great trade routes from the Ural Mountains, the Black Sea, and Asia Minor to Sicily, Marseilles, and the West converged at Corinth.

The Peloponnese has a mountain-system which is derived, like the others of Greece, from the Balkans, runs parallel to and west of Pindus, and shows itself in the Acroceraunian Mountains and in Araecynthus. From the central group of mountains which surround Arcadia, and are highest on its north frontiers between Arcadia and Achaia, e.g. Cyllene (*Zyria*), Aroania (*Chelmos*, 7724 feet), and Erymanthus (*Olonos*) run two important chains, in the same north-north-west to south-south-east direction which we observed in the Pindus. Of these, the westernmost is the Taygetus (*Hagios Elias*, 7901 feet), the highest peak in the Peloponnese, which, after dividing Laconia on the east from Messenia on the west, ends in the promontory of Tænarum; while the eastern one separates Arcadia from Argolis, runs down Laconia under the name of Parnon (*Malevo*), and makes its last appearance as the island of Cythera. And here we may complete our account of the isles of Greece by adding that the Ionian Isles, Corcyra, Cephallenia, Leucas, and Zacynthus, off the west coast, follow the same north-north-west to south-south-east direction as the mountain-chains of the Peloponnese and the mainland.

The *rivers* of Greece are unimportant. They flow generally, both in the Peloponnese and the mainland, south or west. In the latter the four principal rivers have their source on Mount Lakmon, the starting-point of Pindus, and flow, the Aoos (*Viosa*) into the Adriatic, the Achelous (*Aspropotamos*) to the Gulf of Patræ, the Peneus (*Salambrias*) and Haliacmon into the Thermaic Gulf. The principal rivers of the Peloponnese rise near the north of Taygetus: the Alpheus (*Ruphia*) flows west, the Eurotas south.

People.—The ancient Greeks were a branch of that family which includes most European peoples, and also the Persians and the Hindus, and is variously called Indo-Germanic, Indo-European, and Aryan. The Indo-European family is not an ethnological division of the human race, but a linguistic: the languages spoken by the various Indo-Europeans are descended from one and the same original language (now lost), but the peoples who speak it, indeed the people who spoke the original language, need not necessarily, though they may quite possibly, be all of the same descent, for one nation may, directly or indirectly, compel another to adopt its language. Whether the original Indo-European home was in Europe or in Asia is a matter still in dispute. What is less open to doubt is that it was from the north that the Greeks entered Greece, and that they were nomad tribes depending for subsistence mainly on their flocks, though they knew how in extremity to cultivate the ground in a primitive fashion. Metals they were hardly acquainted with; they were still in the Stone Age. As they moved southwards in separate tribes, the foremost tribes were impelled forward by the pressure of those behind; and even when the whole of the peninsula had been for some time filled and fully occupied, a fresh wave of immigrants might wash over the whole country, disturbing everything. Such a wave was the 'Return of the Heraclidæ,' or the 'Dorian Invasion.' The result was to drive emigrants on to and over the isles of Greece to plant Greek cities and Greek culture on the coasts of Asia Minor. At later times Sicily, the Black Sea, Libya, &c. were dotted with Greek colonies; and wherever Greeks were, there, to the Greek mind, was Hellas, which is thus an ethnological rather than a territorial term. As for the name of the Greeks, they called themselves *Hellenes*, a designation the origin of which is still unknown; the inhabitants of Italy called them *Græci*; the Orientals, *Ionians*; while in Homer they are called *Danaans* and *Achæans*.

The modern Greeks are by no means pure-bred descendants of the ancient Greeks. Indeed, it has been maintained by Fallmerayer that from the 7th century A.D. there have been no pure Greeks in the country, but only Slavs. It is, however, pretty certain that the 1¾ million of modern inhabitants are descendants of the three races that occupied the soil at the time of the Roman Conquest—viz. Greeks, Thracians (mod. Wallachians), and Illyrians (Albanians).

Language.—The Indo-European family of speech includes, in addition to Greek, the following branches: Hindu-Persian, Armenian, Albanian, Italian, Celtic, Teutonic, and Slavo-Baltic. Of these that with which Greek was supposed to have the most affinities was the other classical language, Latin; and the two peoples were accordingly supposed to have dwelt together after leaving the original home, and to have jointly gone through a Græco-Italian period. This view, however, is exposed to many difficulties: the inflections of the Latin verb are more closely connected with Celtic; the syntax of Greek bears more resemblance to that of Sanskrit; and while the vocabulary of Latin is more closely bound up with that of the Teutonic languages, the Greek coincides more frequently with the Hindu-Persian. The dialects into which the ancient language was divided may be grouped as follows: (1) Ionic and Attic; (2) Dorian (covering the Peloponnese and its colonies); (3) the North-western dialects (those of Phocis, Locris, Ætolia, Acarnania, and Epirus); (4) Æolian (Lesbos, North Thessaly, Bœotia); (5) Elis; (6) Arcadian and Cyprian; (7) Pamphylian.

The ancient dialects continued to be spoken at anyrate till the time of Tatian (*adv. Græc.* 171)—i.e. the end of the 2d century A.D. By 263 A.D.,

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however, as appears from a letter of the Emperor Julian, and an anecdote told a few years later of Chrysostom, the common people were beginning to have a difficulty in understanding ancient Greek. Inflections then began to disappear, foreign words to debase the vocabulary, the quantity of syllables to be disregarded, Greek words to be mutilated in form and changed in meaning. None of these tendencies were new: they may be detected from the beginning of the life of the language, even in Homer. Nor are they peculiar to Greek. But the conditions were favourable to their development as they never had been before, and rarely have been elsewhere. Foremost amongst these developing conditions must be placed the fact that for centuries the language was not a nation's organ of speech, nor the expression of a national life. Attempts are being made at the present day to revert to the use of ancient Greek, 'correct' Greek (ἡ καθαρεύουσα or νεοελληνική or ἑλληνική), for literary purposes; but the spoken language (δημώδης or χυδαία) is too far decomposed to admit of a successful infusion of ancient forms, and not sufficiently advanced to throw off all connection with the ancient tongue.

Ancient Religion.—That the Greeks worshipped many gods, and those made in the image of man, needs not to be demonstrated. Let it be granted also for the purposes of this article that religion is not the same thing as Mysteries (q.v.), or Mythology (q.v. also), and that the reader may be referred to the special articles on the various Greek gods for their respective attributes and legends. The question at once arises: In what sense of the word could the Greeks have a religion? Their mythology taught them that the gods were deceitful and approved of deceit (Athene), were cowardly, even the god of war (Ares), were guilty of cannibalistic infanticide (Cronos), incest (Cronos and Rhea, Zeus and Hera), bestial amours (Zeus), and what was tantamount amongst immortals to parricide (Uranos, Cronos, and Zeus). And though Greeks did not spend all their days listening to these repulsive stories, they did every day perform a number of rites and ceremonies which were puerile, unmeaning, and absurd; while they showed the opinion they held of their gods by the faith which they had that they could buy their favour or buy off their disfavour by offerings. Nor can it be alleged that this is our way, not theirs, of regarding their myths and cults. From the time of Xenophanes to that of Euripides philosophers and poets did not weary of denouncing the immorality and bestiality of these myths. Plato protested that the current theory of offerings and sacrifice made religion a variety of higgling in the celestial market, a sort of political economy of the spiritual world. Aristophanes and the comedians of the old school could place a god in *propria persona* upon the stage to be derided for his cowardice, braggadocio, and gluttony. Under these circumstances, then, what sort of religion was it that the Greeks could have?

In the first place, whether it was that Zeus controlled the other gods, or that he as well as they was guided by fate or destiny or necessity, the universe was, the Greeks believed as well as we, ruled for some good end. In other words, they had faith; and—which enlists our sympathies—that faith was tried. They were not slow to observe that, though the good do often prosper and the wicked suffer in this world, the rule is far from absolute; and we find, e.g. in Theognis and Solon, that they could not reconcile this with their faith, but for all that they did not cease to believe. Again, whatever faith they put in the efficacy of sacrifice and rites and ceremonies, they also believed that a good life was that which was most acceptable in the sight of the gods. They certainly believed that wrong-doing provoked the displeasure of heaven, and Æschylus was led to discover that the sins of the father were visited on the children, while to Herodotus and the Greeks generally their gods seemed jealous gods. If it be asked how all this could be reconciled with a belief in their revolting myths, there are various answers: what was right for the gods might be not right for men, just as the schoolboy has no doubt that it is right for his father but not right for himself to smoke, sit up late, or the like; or the myths might be the invention of misguiding or misguided poets, or might mean something and were not to be interpreted literally.

Next, as to their conception of a future world. In the earliest (Homeric) times it could scarcely have been a potent religious factor; it is almost purely mythological. If a wrong-doer like Sisyphus or Tantalus is punished in Hades, merit can hardly be said to be rewarded: the ghost of Orion continues, like the Red man's spirit, to go hunting, but Achilles thinks the meanest life on earth preferable to being king of the shades below. But in course of time, when it became impossible to believe that the good were always rewarded and the bad punished in this world, and when even the theory that the sins of the father are visited on the children was found an inadequate explanation of the sufferings of the innocent, the belief in a system of future punishments and rewards grew in strength, and in Plato's time (*Rep.* 330 D. and 363) was firmly held by the average respectable Greek. On the whole then it seems probable that in Greece myth did not kill religion, and that it was not myth but religion which dominated the morality of Greece, as it also dominated Greek art, especially sculpture.

The Greeks, therefore, were not without religion. How then did it differ from modern systems? The more educated Greeks were, in many cases, monotheists, Zeus being supreme, and the other gods his angels; and the conception of the paternal love of God was not strange to them. The essential difference is that the Greeks were not taught their religion by authority, whether of revelation, the state, or a priesthood. They had no revealed book (Homer and Hesiod fixed the theogony indeed, but not the religion); they had no priests having authority, and as long as a Greek performed the rites prescribed by the state he might interpret them as he pleased. Thus, though on the one hand there was nothing to prevent a man becoming a practical monotheist, on the other, for want of organisation and authority, the many elements of good there were in the religion of the Greeks doubtless acted less potently than they might have acted. Let us remember, however, that had any dogmas been enforced, they might have been the wrong ones. Finally, it is in harmony with the Greek character generally that in Greece there was no devil.

In modern Greece the church is the Orthodox Greek Church, which is 'endowed' in that bishops and archbishops are paid by the state (the inferior clergy, however, by voluntary fees), and is 'established' in that the archbishops and bishops are nominated by the king, as is the Synod of Five which is supreme in the church; and that, except in purely spiritual matters, the synod is dependent on the government.

History.—The earliest fact in the history of Greece of which we can feel certain is the Dorian invasion, or as the mythical version of this undoubtedly historic fact terms it, 'the return of the Heraclidæ.' Its date can of course only be approximately conjectured, but we may take it that the changes in the ethnological map occasioned by the Dorian invasion took about a couple of centuries to effect, and were completed about 1000 B.C.

The Homeric poems relate events which the author or authors supposed to be prior to the Dorian invasion; but the supposed facts belong probably to the domain of myth, and the poems themselves were certainly composed after the Dorian invasion. Whether the remains discovered by Schliemann at Troy, Mycenæ, and Tiryns date from before or after the invasion is still a moot point. The balance of opinion is in favour of the earlier period, on the ground that nothing but such a political cataclysm as the invasion could sweep away so completely the very memory of the dynasties which erected the marvellous monuments that remain to us. But even if the earlier date be assigned to these remains we are still in complete ignorance as to the name and even the race of which they are the sole memorials. It was once the fashion to call everything dating from before the Dorian invasion Pelasgic, and imagine that thereby all was explained. The Pelasgi were a mysterious people about whom nothing was known, and conjectures were most divergent. Very frequently they were identified with the common ancestors of the Greeks and Italians. But a Græco-Italian period and people are now on the way to being discredited: and the Pelasgi, if we confine ourselves to facts, were an insignificant tribe of Greeks. Finally, we may dismiss the period antecedent to the Dorian invasion by noting that in it the Phœnicians were believed to have largely influenced Greek culture; but the extent of their influence is now universally admitted to have been exaggerated, and it is a question whether it must not be referred wholly to a later period.

Of the Dorian invasion itself, what we know is that the tribe which had occupied Epirus moved into the valley of the Peneus, and were henceforth known as Thessalians; that probably in consequence of this the Arnæans, who had occupied Thessaly, were forced forward into the basin of the Copais, where they are known to history as the Bœotians; while from Doris bands of warriors kept crossing the Corinthian Gulf, finding their way across Arcadia to the south and east of the Peloponnese, and there forming Dorian settlements. Possibly to the same period we may assign the occupation of Elis by the Ætolians. Attica lying out of the direct line of impact, which was from north to south, was unaffected by these movements, except that fugitive families, especially of the same Ionic race as the inhabitants of Attica, took refuge there. On the other hand, it is to this movement that the Dorian state, Sparta, which was to be the great and victorious rival of Athens, owed its origin, and indeed we may say its subsequent greatness. The constitution and the peculiar institutions which made the Spartans a nation of soldiers are indeed referred, rather by myth than tradition, to a great legislator, Lycurgus. But they are in truth partly Indo-European customs preserved more faithfully by Sparta than by other Greeks, and still more the outcome of the perpetual struggle for existence which for generations was waged by the handful of Spartans against the large numbers of the native inhabitants. The Dorians settled in Sparta were indeed but a garrison in the beginning; and, to the end, their national life was that of the camp. Amongst the other consequences of the Dorian invasion that which most calls for notice is that in the various districts affected by it the original inhabitants were reduced to slavery; some being like the Helots in Sparta, serfs attached to the soil and belonging to the state rather than to any individual owner, others like the Perioeci, in Sparta, enjoying personal freedom, local self-government though not political rights; and both being very different from the bought slaves (frequently or mostly foreign) who formed the foundation on which Athenian civilisation, for instance was based.

The effects of the Dorian invasion, however, were not confined to Greece proper; amongst them must be included the expansion of Hellas in the wider sense of the word, and the colonisation of the coasts of Asia Minor. Not all the original inhabitants of the districts invaded remained to be enslaved: many fled over seas, the Æolians to found the Æolian cities, the Ionians to plant the Ionic colonies south of the Æolian, while the Dorians found their way by Crete to the shores south of the Ionic colonies. Of the law that colonies are more rapid in their development than the mother-country, the most conspicuous example is afforded by the Greek colonies in Asia Minor. The seeds of literature, art, and philosophy were all sown and first nurtured in the colonies, though to come to maturity it was in many cases necessary that they should be transplanted to the mother-country. In political life and constitutional history the stages through which Greece proper went were anticipated in the colonies; the change by which monarchy was set aside by aristocracy did indeed perhaps take place about the same time at home and in the colonies—we have little evidence how it took place anywhere—but the change by which aristocratical government was overthrown and democracy established was incomparably more rapid in the colonies. A colony is not the place in which privilege flourishes; tradition is less potent and individual energy more certain of its reward than at home. It was in the colonies, the western not the eastern, that the custom which preceded law was first reduced to writing, and the sole right of expounding it withdrawn from the privileged classes. It was in the colonies also that tyranny was first invented. A Greek tyrant was usually an aristocrat who, under the pretence of relieving the misery of the people, acquired a power which he used for crushing his own class and the people alike beneath his own illegal, personal, and violent sway. As he acquired his power by force, so by force he maintained it, and so by force he lost it, generally in a very brief time; though we must not forget that Syracuse under the tyrant Gelo defeated the Carthaginian power, and under his successor, the magnificent Hiero, almost made Sicily one state.

The rapid, indeed the premature, development of the Greek cities in Asia Minor is testified to by nothing more clearly than by the large number of colonies which they, themselves colonies, founded. The settlements on the Black Sea—e.g. Sinope, Trapezus, Cyzicus—were their creation, as were those in the remotest west—e.g. Marseilles. Many colonies, however, were founded direct from home: the coasts of Macedonia and Thrace were colonised from Eubœa, and it was the Chalcidians of Eubœa who led the way in the colonisation of the west—e.g. in Italy, Cyme and Rhegium; in Sicily, Naxos. A notable mother of colonies too was Corinth: Corcyra, Leucas, Anactorium, Ambracia, Apollonia, and Syracuse were all sprung from Corinth, and themselves in their turn sent out colonies. Thus all three of the basins of which the Mediterranean consists passed out of the hands of the Phœnicians, who had hitherto monopolised them, into the hands of the Greeks, as a rule without bloodshed, for the Phœnicians were traders and loved not fighting. But eventually the Carthaginians made a stand, and in 532 B.C., in alliance with the Etruscans, defeated the Greeks off Corsica, and secured the safety of their possessions in Africa and of the few towns left them in Sicily. Great, however, as was the expansion of Hellas and her colonies, no Greek state ever possessed a colonial empire; the colonies could not and would not be governed from home.

The difficulties of communication and the Greek love of autonomy secured the independence of the colonies as far as the mother-states were concerned, but not as against neighbouring and foreign powers. Thus, the Asiatic Greeks fell an easy prey, first to the Lydian monarch Crœsus (560), and then to the Persian Cyrus, the conqueror of Crœsus (546). And thus the Persian empire was brought into the necessity of absorbing or endeavouring to absorb Greece in the same way as the Roman empire was compelled to annex Britain; in the one case Britain, in the other Greece, offered a refuge and a *point d'appui* to fugitives and instigators to revolt. In the one case Gaul, in the other the Asiatic colonies, would never cease struggling for independence as long as their kinsfolk across the sea were free. What the course of events was which raised up in Greece a power competent to repel the flood of barbarism which threatened to extinguish the art, literature, and philosophy of Greece, and therefore of the world, we must now briefly state.

The weakness of Greece in the face of an invader was that although the Greeks were no longer nomads but had reached the stage of city life, and although the bond of blood and kinship was being displaced by the tie of neighbourhood and territorial organisation, the numerous communities were subject to no central government. The state of things in Greece may be compared—reasonably, for it had its origin in similar circumstances—with that in England at the time of the so-called Heptarchy, except that there were many more than seven independent states in Greece, and scarcely any of them were as large as even a small English shire. Most of them were cities with but three or four miles of territory; only two succeeded in reaching the size of an English county. Those two were the greatest names in Greece, Attica and Sparta. By what process of coalescence (or *synoikismos*, as it is called) the various village-communities of Attica became united with Athens for the seat of government we know not. Nor can we do more here than say that before the Persian wars Attica had passed through several social and political and politico-economical crises; Solon's reforms remedied the latter, but his political measures did not prevent the institution of a tyranny, that of Pisistratus and his sons. The tyrants, however, were expelled, and the democracy of Athens placed on the path which it was to follow by Clisthenes.

Meanwhile in the Peloponnese Sparta was obtaining that position of supremacy which subsequently enabled the Greeks to offer resistance to the Persians with some show of unity. Not only did Laconia stand to Sparta somewhat in the same relation as Attica to Athens, but Sparta conquered the neighbouring territory of Messenia (after two desperate wars), and deprived Argos, hitherto the leading state in the Peloponnese, of the district between Parnon and the sea, and of Cythera. Here, however, Sparta's career of conquest and annexation was arrested by the sturdy and successful resistance of the small city of Tegea; and henceforth Sparta's policy was confederation, not annexation. The league of states which had followed Argos was broken up; Epidaurus, Phlius, Trœzene, Hermione, and even Ægina went over to Sparta. Elis had become bound by community of interest to Sparta in the Messenian wars; and Tegea and Arcadia having resisted annexation, submitted to confederation. Thus, in the Peloponnese at least, Sparta was the undoubted leader of the Greeks; and, outside the Peloponnese, Athens promptly set the example of acknowledging Sparta to be the proper leader of all Greece against the Persians. But in 490 B.C., when Datis and Artaphernes, at the command of Darius, led the first Persian expedition against Greece, it was Athens alone that withstood them, and single-handed won the glorious victory of Marathon, thanks to the genius of Miltiades and the valour of her sons. For a time the danger of invasion was averted, but only for a time. If, however, Xerxes, the successor of Darius, availed himself of the interval for enormous preparations, Athens, also under the keen-sighted guidance of a great statesman, Themistocles, was also preparing that navy which was to deal the final, fatal blow at Xerxes. The number of that monarch's troops we have no means of estimating; we may safely say it was the greatest army that ever took the field. The Greeks' first line of defence—the pass of Tempe—was given up because it could be turned. The second—Thermopylæ and Artemisium—was turned, and the famous band of Spartans were sacrificed by the hesitation and procrastination of the Spartan government. Then the Persians ravaged Attica and destroyed Athens, but not the Athenians. They had fled to the neighbouring island of Salamis, and there they defeated, thanks to Themistocles, the Persian fleet, and sent the Persian monarch home in flight (480 B.C.). Then, indeed, the Spartans made up their minds to join the Athenians in attacking the Persian commander who had been left behind in Greece with a large force. With his defeat at Platæa (479 B.C.) and the victorious attack made by the Greek fleet on the enemy in his own waters at Mycale (479 B.C.) the Persian wars came to an end, and the seeds of a far more fatal struggle, because internecine, were sown. That struggle was between Athens and Sparta.

The position of undisputed leadership which Sparta had enjoyed at the beginning of the Persian wars she had lost before the end of them. For this the main reason must be admitted to be that Sparta acted with disgraceful selfishness, Athens with glorious self-sacrifice, throughout. When, therefore, the Greeks of the islands formed a league—the Confederation of Delos—for defence against the Persians, it is not surprising that the foremost place in it was accorded to Athens. In course of time many members of the league preferred to pay monetary contributions rather than supply ships and men; Athens on the contrary was ever eager to provide both men and ships. Thus Athens came to have the power of the sword—and therefore of the purse—in the confederation, which now was practically constituted not of allies but subjects. Not content with the command of the sea she thus acquired, Athens by a series of victories and under the guidance of Pericles attained a position of commanding influence in continental Greece, which, however, only endured from 456 to 445. In spite, however, of the loss of influence occasioned to Athens by her defeat at Coronea (447), and in spite of the Thirty Years' Truce concluded in 445 between Athens and Sparta, in 432 Athens and Sparta, making a quarrel between Corinth and Corcyra their pretext, began their great duel, the Peloponnesian war. Sparta was by its constitution a predatory, Athens an industrial state. The Spartans were farmers, the Athenians merchants. Sparta's strength was on land, Athens' on sea. Sparta prided herself on the ignorance of her sons, Athens on being herself the instructress of Greece. Sparta represented and received the support of oligarchy; Athens, democracy. For thrice nine years, as the oracles prophesied, the war lasted. Its varied and tragic fortunes cannot here be traced. Suffice it to say that there were three things which brought about the defeat of Athens: the early death of her greatest statesman, Pericles; her attempt, magnificent and tragic, to conquer Sicily; and the Persian gold which Sparta was base enough to accept and use.

Thus the supremacy of Sparta (404–379) was established. But it was no sooner established than

a reaction set in against it. Sparta had proclaimed at the Peloponnesian war that her policy was to restore to the Greeks the freedom which the Athenians had robbed them of. True it is that Sparta broke up the confederacy of Delos; but she did not give freedom to Athens late subject allies. She merely displaced democratic by oligarchic governments, and placed in each town a Spartan harmost or governor, whose excesses and violence made Sparta loathed. At the same time it was not the interest of the Persian king to allow Athens to be entirely crushed, or any single state to have preponderating power in Greece. Thus an anti-Spartan coalition was formed; and in spite of the peace of Antalcidas (387), the terms of which were designed to prevent the formation of any more such confederations as that of Delos, in 378 Athens was enabled to form a new confederacy, and to carry on hostilities with Sparta. These hostilities were not decisive, but they allowed Thebes to unite all Boeotia into a single state, and by the genius of Pelopidas and Epaminondas, so to consolidate its power as to defeat Sparta at Leuctra (370), and establish a Theban supremacy. Sparta had to withdraw her harmosts from all cities; and everywhere the democrats in consequence came into power. Arcadia was made into one state with a new city, Megalopolis, at its head; and Messenia was made independent of Sparta. But Thebes was wholly unequal to the position which she aspired to occupy; Athens united with Sparta in resisting her, a great anti-Theban coalition was formed, and when Pelopidas fell at Cynoscephalæ (363) and Epaminondas at Mantinea (362) Thebes lost the only two men of genius she possessed, and with them all hope of maintaining the position she had attained.

Thus the village-communities with which Greek, like English history, begins had become city-states; but the Greeks travelled no further along the path of political coalescence or *synoikismos*. If the English did travel further through heptarchy to final unity, it was because in England 'war begat the king,' whereas in Greece monarchy (if indeed it ever existed) passed away before history begins; and the spirit of autonomy, begotten of republican rule, was centrifugal in tendency. Meanwhile in Macedonia, whose inhabitants, if not of Greek blood, were not distantly akin to Greeks, a kingdom was forming which was destined to impose on Greece, from without, the only unity it was capable of receiving. The steps by which Philip of Macedon made himself master of Greece were well marked and rapid. The first places to be absorbed by the expansion of Macedonia were the Greek colonies on the coasts of Thrace and Macedonia, in 357 Amphipolis and Pydna, in 356 Pangæum, in 353 Halonnesos, Abdera, Maroneia, Methone; and in 348 the fall of Olynthus and its thirty-two confederate towns gave the whole coast as far as the Hellespont into the hands of Philip. The next step to take was to obtain a footing in the internal affairs of Greece, and this he succeeded in getting, as far as northern Greece was concerned, in the Sacred War (355). Thebes having in vain endeavoured to impose its supremacy on Phocis, abused its influence over the Amphictyonic Council to declare a sacred war against the Phocians. The latter found assistance at the hands of the tyrants of Pheræ in Thessaly, and the aristocracy of Thessaly consequently placed themselves under the protection of Macedonia. Meanwhile, even Athens had at last given ear to Demosthenes' denunciations of Philip, and opened her eyes to the danger which threatened her, when her own colonies were captured by Philip; and war had been declared, though not immediately waged, against Philip by Athens. But the Sacred War ended (346) in the destruction of the Phocians, and Athens having ruined herself by procrastination—concluded a peace with Philip which confirmed all his gains and ratified all her losses. As yet Philip had found no excuse for interfering with the affairs of the Peloponnese; but this was afforded him in 344 by an ill-timed revival of Sparta's pretensions, which drove Messene, Argos, and Megalopolis into the arms of Philip, in spite of Demosthenes' propaganda in the first two places. In 340 Athens, having formed extensive alliances, felt strong enough to openly declare war against Philip. In 339 she saved Byzantium from his attacks, and thereby kept open the route by which her own corn came from the Black Sea. In 338 she at length (and too late) consented to Demosthenes' proposal to convert the moneys hitherto devoted to public amusement to military purposes. But the fatal field of Chæronea was followed by the peace of Demades. Philip was acknowledged master of Greece, and elected general of the Hellenic forces against Persia; but before he could commence his invasion of that country he was assassinated by a private enemy (336). A general rising against the Macedonian power was promptly nipped in the bud by Philip's son and successor, the world-famous Alexander. His first act was to suppress the attempted revolt by utterly destroying Thebes. In 334 he commenced his invasion of Persia. We can but enumerate his chief victories: in 334 his victory at Granicus gave him Asia Minor, on this side of Mount Taurus; in 333 he defeated Darius in the battle of Issus; in 332 he stormed Tyre and Gaza and founded Alexandria; in 331 he finally overthrew the Persian empire in the battle of Arbela; in 326 he crossed the Indus, but farther his troops refused to follow him. He then sailed down that river to the Indian Ocean, and thence marched to Babylon, where, while preparing to invade Arabia, he fell ill and died (323). Alexander not merely conquered Asia Minor—he planted Greek colonies in it, and these centres of culture discharged functions of the highest importance in the history of the world. They gave to Greek culture, Greek literature, thought, and art, even to the Greek language itself, a career independent of and unaffected by the fate or decay of Hellas itself. They made Greek the language of the civilised world, though it is true that it was not pure Attic, but the 'common' dialect, Hellenistic Greek—yet the language of the New Testament. In Alexandria were sown seeds for the fruits of which we refer to the section on the literature. Finally it was from these colonies that the Mohammedans made their acquaintance with Greek learning; so that in the time of darkness, when the very tradition of Greek learning had perished from out of western Europe, the Mohammedans were busy annotating Aristotle even in Timbuctoo.

The death of Alexander was the signal for a fresh struggle for independence; but this, the Lamian, war ended with the battle of Crannon (322) in the victory of the Macedonian general Antipater and the extinction of political liberty in Greece. In the struggles between the Diadochi ('the successors') for empire, Greece was the battlefield. Even when the various generals had made themselves monarchs of the kingdoms into which Alexander's empire split, and Greece was left unappropriated, the efforts of a statesman such as Demochares to obtain a position of independence for Athens by playing off one monarch against another were fruitless. All that lends interest to the next period—that of the Epigoni—is that a new form of political coalescence—federation—was tried, and with some success, by the Ætolian and Achæan leagues. But the centrifugal tendency in Greek politics was manifest in Sparta's

refusal to join the latter league, which thereon invoked the assistance of Macedonia. Macedonia's interference between Rome and Carthage led to the defeat of Philip V. at Pydna, 168 B.C.; and in 146 Corinth was destroyed by Mummius, and Greece became in fact, if not at once in form, a province of the Roman empire. As such there is nothing here to say of it. Nor at a later time has Greece a history separate from that of the Byzantine empire (q.v.). In 330 A.D. Constantine was converted to Christianity, and founded a 'new Rome' in Constantinople. In 395 Greece was ravaged by the Goths under Alaric. In 747 a great pestilence depopulated large parts of the country, into which Slavonic tribes immigrated. In 1018 the Bulgarians laid the country waste, but were finally defeated by Basil II. The final separation of the eastern and western churches took place in 1053.

In the year 1453 Mohammed II. made himself master of Constantinople and, amongst other portions of the empire of the East, of Greece proper. Cyprus and Crete (which had been in the possession of the Venetians) and the other Greek islands gradually passed into the hands of the Turks, Crete coming into their power in 1669. Twenty years after, the Venetians again began war in the hope of regaining their Greek possessions, and succeeded in winning back the Peloponnese only to lose it again in 1715. Under Turkish rule the Greeks were allowed to become comparatively wealthy, as in the Turkish empire the function of the subject races is to provide for the sustenance of the ruling Turks. With wealth came the spread of education and culture, and a revived consciousness in the Greeks of what mighty dead they were the descendants. Thus the soil was gradually and naturally prepared for the seeds sown by the French Revolution; and in 1821 the war of independence broke out. In less than a year the Turks were turned out, and Greek liberty recovered. But civil war ensued; nor was this unnatural. The leaders of the revolution were men who had acquired what capacity they had for leading in the service of the Turks, and had acquired it therefore in a bad school. The cold suspicion with which the struggle for liberty had at first been watched by Europe was eventually exchanged for warm sympathy and pity, owing to the horrible cruelties perpetrated by the Turks; so that when in 1824 the latter, by the aid of troops from Egypt, succeeded in regaining possession of Greece, there were not wanting volunteers from England and elsewhere to lead and fight amongst the Greek forces. In 1827 the Turkish fleet was destroyed at Navarino by the fleets of England, France, and Russia; by French aid the Turks were driven out of Greece, and in 1828 the Greeks had once more regained their liberty. In 1832 Otho of Bavaria was made king; but he ruled despotically, and in 1862 had to leave Greece in consequence. A son of the king of Denmark, born in 1845, was then made king under the title of George I., when the Ionian Islands (q.v.) were given back to Greece. He lost popularity by his unwillingness to be forced by the popular will into war with Turkey. The Berlin Treaty added a large area in Epirus and Thessaly to Greece (see TURKEY); and under George the country, in spite of mismanaged and embarrassed finances and frequent ministerial crises, was fairly prosperous till the disastrous war with Turkey in 1896. During the troubles in Crete the Greeks sent an expedition thither (in February); early in April 1500 irregular Greek troops crossed the Macedonian frontier; and the Sultan declared war on 18th April. The Turks not merely drove the invaders out of Macedonia and Epirus, but after a brief series of engagements, disastrous for the Greeks, occupied Larissa and other main points in Thessaly. The war came to an end about the middle of May, and peace was ultimately arranged, with a slight rectification of the frontier in Turkey's favour, and the payment of a war indemnity of £4,000,000, guaranteed by the Powers—the Greek customs meanwhile to be controlled by an international commission.

Modern Greece.—The legislative power is vested in a single chamber, which consists of at least 150 paid representatives, elected under the ballot by universal suffrage for a period of four years. Greece is divided into sixteen nomarchies or departments, which are again subdivided into eparchies and demarchies. The Greek Orthodox Church is established by law, and to it the great mass of the people belong (see GREEK CHURCH); but there are some 25,000 Mohammedans in Thessaly and Epirus. There are some 160 monasteries and nunneries, with 2600 monks and 500 nuns. Elementary education is compulsory for children between five and twelve; but the law is not enforced outside the towns. Of the army recruits 30 per cent. are illiterate, and only 15 per cent. can read. The revenue is between £3,000,000 and £4,000,000; but usually the actual expenditure has greatly exceeded the revenue. The total debt amounts to £33,000,000, without the last war indemnity. Fully a third of the expenditure is absorbed by the interest on the debt, and a fifth by the ministries of war and marine. The nominal strength of the army on a peace footing is 25,000—which in war is raised to 100,000; all able-bodied males are liable to service. The navy consists of four small ironclads, sixteen gunboats, twenty-one torpedo boats and launches, with nearly 3000 officers and men.

In 1879 the area of Greece was 19,809 sq. m., with a population of 1,679,775 (1,457,894 in 1870); the Thessalo-Epirot districts incorporated with the kingdom in 1881 (as an outcome of the Berlin Treaty) added to this a territory of 5161 sq. m., with a population of 299,677; total, 24,970 sq. m. (less than half the area of England), with 1,979,452 inhabitants. At the census of 1889 the population was 2,187,208. Besides the Greeks of the kingdom, the Greeks in various parts of the Ottoman empire —notably in Constantinople, Macedonia, the western parts of Asia Minor, Crete, Cyprus, and the smaller islands—number above 6,000,000. Most of the Albanians who have migrated into Greece have been completely Hellenised; the non-Hellenised Albanians in Greece number about 100,000. In Greece there is an excess of males over females in the proportion of 107·6 to 100. Athens, the capital, has a population of 110,000; the towns next in size being Patras, Piræus, Hermupolis, and Corfu, all above 20,000; and there are four others between 20,000 and 10,000. Greece, although one-half of its area is pasture-land or waste, is mainly an agricultural country; but the land is mostly in the hands of peasant proprietors; agricultural machinery is unknown in many districts, and the implements of husbandry are of the most primitive type. Besides cereals, fruits, sugar, tobacco, cotton, and dyestuffs are raised. The chief articles of export are currants (about half of the total, though depression in this trade has of late years caused great distress), lead and other ores, olive-oil, wine, honey, sponges, &c. The principal imports are cereals and textile goods. The exports have an annual value of about £3,000,000; the imports are valued at £4,400,000 a year. Nearly a third of the total trade is with Britain, and about one-seventh each with Russia and France. The herding of sheep (3,465,000) occupies about 9 per cent. of the people; the sponge and coral fisheries employ more than 900 boats. The minerals of Greece include lignite, argentiferous lead, zinc, magnetic iron, and marble. In 1895

there were some 1200 flour mills worked by water and wind, and less than 100 by steam; over 200 distilleries; and numerous dye works, tanneries, and manufactures of machinery, cotton and silk goods, &c. 570 miles of railway were open, and 300 in course of construction; and there were nearly 4900 miles of telegraph lines. For the canal across the isthmus of Corinth, see CORINTH.

Literature. The distinguishing characteristic of classical Greek literature and the clue to its development is the fact that it was oral, that it was in all cases composed not to be read with the eyes, but to be delivered by the lips and heard by the ears. It is the distinguishing characteristic, because when Greek literature ceased to be oral it ceased to be classical; and it affords the clue to the evolution of classical Greek literature, because that literature went through a series of forms—epic, lyric, and dramatic, historical, oratorical, and philosophical—which forms were impressed on it by the changing nature of the circumstances under which the composer addressed his audience. These circumstances varied not capriciously but directly with the change of social and political conditions. Thus, in ancient Greece the form of literature prevailing at any given period was the expression and outcome of the form of society existing at that time; and hence the history of the literature is but one aspect of the history of the people. That the place and occasion on which an audience is gathered together determines the form of that which is addressed to it is plain enough in the case of a sermon and a play. That it was not the author who determined whether a play or an oration should be most popular is explained by the fact that it is the great public which it is most artists' ambition to please; and it was circumstances which decided that the great public in Athens should be found at one period in the law courts rather than in the theatre, at another in the theatre rather than in the law-courts. When political liberty was extinguished in Greece there ceased to be a great public, works were composed for the approval of learned and narrow cliques, and classical Greek literature was at an end. Without a great public, no great artist.

We now propose to trace the successive forms through which classical Greek literature went, and to show to what social and political causes these were due. For details as to the lives and works, and for criticism on the genius, of individual authors, we must refer to the articles in which they receive individual attention. In the literature of Greece, as of other countries, verse preceded prose, partly because the pleasure verse gives to the ear is much more pronounced and more easily produced, and partly because verse is so much more effectually retained in the memory a point of cardinal importance when writing is as yet unknown. Of poetry, the first form to appear in Greece was epic. An epic poem is a narrative poem; and the epics of Homer—the only epics that have come down to us, though by no means the only epics composed—are of considerable length. This fact, which has been regarded since Wolf as indicating that the poems could not have existed at such length when writing was either unknown or not used for literary purposes, is really the best proof that they belong to the most ancient period of Greek literature. That poems as long as those of Homer may be handed down by memory is beyond doubt. The question is when and where could a public have existed for whom we may suppose them to have been composed? They cannot indeed have been recited at a single sitting; therefore they cannot have been composed for audiences such as those at the great Greek festivals. They must have been composed for an audience small enough to be gathered together night after night until the whole had been recited. Further, the audience must have been such as it was a pride for the artist to address. The only audience which satisfies all these conditions is that which is occasionally described in the Homeric poems themselves, that gathered in the hall of the chieftain of the village-community, which was the earliest form of Greek as of English society. At no other period in Greek history was there an audience for whom we can conceive a poet composing such poems as those of Homer.

When in the natural course of development the village-community expanded into the city-state, the village chieftain's hall ceased to be the centre of society. 'Society' now consisted of the members of the aristocratic or oligarchic families. They cared not to hear of the past glories of the heroic ancestors of those chieftains whom they may themselves have helped to turn out of power. Nor was the same audience gathered together night after night in any great house; *symposia*, or drinking-parties, were indeed given frequently, but the guests were not the same on each occasion. Song again was as much in request as wine at these drinking-parties, but the songs were from the nature of the case short, their subjects drawn from the present, not from the past, and their most frequent themes, love, wine, and politics. In a word, the second form assumed by Greek literature was that of lyric poetry—the lyrics of Sappho, Alcæus, Anacreon, Archilochus, Ibycus, Theognis. There was indeed another form of lyric, which was choral and religious; and it needs special mention, not because its genesis differed essentially from that of other lyric poetry, for it also was composed for a special occasion, with reference to the present and under circumstances which precluded length of treatment, but because from it was developed the third form of Greek verse literature—the drama. Choral lyric might celebrate the victory of some athlete at the national games, or the mighty works of the god at whose festival the poem was designed to be performed. The odes of Pindar which have come down to us belong to the former class. To the latter class belong the odes addressed to Dionysus (q.v.), the god of wine, from which the drama was evolved. Unfortunately of these odes, dithyrambs, we have not a specimen. Simonides of Ceos, Arion, and Alcman were the great composers of this class of lyric.

That an ode relating the adventures of a god should first be accompanied by sympathetic gesture and action, and should then come to be really acted, is readily comprehended. And that the gestures should be especially realistic at the festivals of the god of wine is not hard to believe. But it is not probable that literary form would have been given either to the more or to the less solemn side of this piece of ritual had it not been that present on these occasions was a public greater than any that a poet had hitherto been able to address—i.e. the whole of the community gathered together for an act of public worship. The development of the drama was the work of democracy. A greater audience was provided at the public festivals of a democratic state than could be found in the house of any oligarch; and genius at once deserted the form of literature adapted to the symposium for that by which it could reach the ears of the people at large. At the same time the drama, though it required other powers as well, afforded scope for the exhibition of both epic and lyric power. The chorus, out of which the drama grew, was still retained in the drama; and thus lyrics were an essential part of the play. On the other hand, much of a Greek play consists in the narrative of what has occurred off the stage. The number of

dramatic poets produced by Greece was very great; for us the tragedies of Æschylus, Sophocles, and Euripides—The Three—and the comedies of Aristophanes, are the Greek drama.

But the drama is not the only form of Greek literature for which we have to thank Greek democracy. To it we owe all three forms of prose literature—history, oratory, and philosophy. For now at length, after composition in verse had been practised for some four centuries, composition in prose was attempted, which—seeing that the Greeks had spoken prose all the time, even as M. Jourdain—seems strange. In fact, however, a really original idea, indeed even a moderate departure from what 'is always done' on a given occasion, is not of frequent occurrence in the history of the world. The mere conception that it was possible to compose otherwise than in verse seems not to have occurred to any one. Then, to put on paper a series of connected ideas, when one has them, is not a matter of absolute ease and simplicity. It is quite conceivable that it may have been easier to write in verse than in prose; the earliest philosophers Xenophanes, Parmenides, Empedocles apparently found it so. When, however, the idea of prose composition had been once struck out, it was, thanks to the encouragement afforded by the great public, rapidly worked out in various directions. So rapidly indeed that it is difficult to say whether oratory, though distinctly posterior to history, is or is not to be ranked as earlier than philosophy. As, however, the style of the greatest writer of philosophy, Plato, would certainly not have attained the perfection it displays had not some of the orators previously demonstrated what could be done with the language in certain directions, we may consider philosophy to be the latest of the three forms of Greek prose literature, and to correspond to the latest of the three forms of Greek verse literature, the drama, in that each resumes in itself the two forms which precede it. Narrative and argument both find their place in philosophy, as lyric and epic in drama. Oratory, like lyric, is the expression of the individual man dealing with the present. Prose begins with narrative in the form of history, as verse begins with narrative in the form of epic.

Again, it is somewhat difficult for us to realise that history could have been composed for oral delivery. But the fact remains that, though in the time of Xenophon, the most recent of the three historians whose works have survived, there was a trade in books, at the time when his predecessors Thucydides and Herodotus composed their works there was no reading public for whom they could have intended their histories. Herodotus, the 'father of history,' probably recited his at the great national festival of the Olympian games. Thucydides as much as states that he wrote for posterity, and implies that in so doing his design was singular.

In the case of oratory, the essentially oral nature of this form of literature is patent. That it should have been developed as a form of literature when it was is due on the one hand to the cultivated taste of the democratic *dicasts* or jurors, who demanded literary merit in the speeches addressed to them, and on the other to the frequent access to the great public afforded by the law-courts to aspiring genius. The accident that at Athens a suitor was compelled himself to speak on his own behalf, and therefore evaded the intention of the law by getting a professional speech-writer to compose a speech for him to learn and deliver as his own, did much to open the law-courts to literary genius and to develop eloquence. Of the orators we are fortunate enough to have considerable remains—of Antiphon, Andocides, Lysias, Isocrates, Isæus, Æschines, Hyperides, and, greatest of all, Demosthenes.

Finally, the third form of Greek prose literature, philosophy, was essentially oral. Socrates, who gave to philosophy the direction it has followed to this day, never wrote a word. Plato and Aristotle lectured, and if they also wrote, it was that their written teaching might be read aloud in the schools they founded, after they were gone.

In nothing is the post-classical period of Greek literature more remarkably distinguished from the classical than in the fact that we no longer find one form of literature cultivated at a time, but all kinds simultaneously. If the term 'post-classical' is sometimes employed, and sometimes justly resented as being almost a term of reproach, it must be admitted on the one hand that Theophrastus, Theocritus, Menander, Plutarch, Lucian, are names that would adorn even a 'classical' period, and on the other that, notwithstanding these great names, the post-classical period created no new form of literature, that, viewed as a whole, it can point to no progress made in any of the forms already created, and that all its activity, which was enormous, was in the direction of deterioration. When we pass from the classical period to the post-classical we have as our guiding principle not development but decay. In the Alexandrine period (332–146 B.C.) this is less notable than in the ages which succeeded it up to the fall of Byzantium (1453 A.D.), though it is unmistakable. The Alexandrine period is so called because Alexandria, the colony founded by and named after Alexander, became, thanks to the learned liberality of the first three Ptolemies, the seat of two great libraries, and the greatest centre of literary culture. But though the greatest it was by no means the only such centre of culture in the age to which it gives its name. Egypt was not the only one of the kingdoms that rose from the ruins of Alexander's empire which could boast of a literary capital supported by the liberality of its kings. Antiochia, Pella, and, above all, Pergamum, vied with Alexandria; and the rivalry of Pergamum was only extinguished when Antony sent its magnificent library of 200,000 volumes as a present to Cleopatra. But before this Pergamum had had time by its cultivation of rhetoric to affect Rome and Roman oratory in no small degree. Nor were the true Greek abodes of literature at once deserted by the Muses during this the first period of decline. In Athens the new comedy, with Menander for its great representative, and philosophy, with Theophrastus as its chief, still flourished. In Syracuse there was developed, not indeed a new form of literature, but a new mixture of ancient forms—bucolic poetry, which is a mixture of the narrative and the dramatic forms, while, although the (usual) employment of the hexameter might approximate it to epic, the recurrence of a refrain gives it a lyrical air. History can be said to exhibit, at the most, incipient decay in a period which can point to Polybius, to say nothing of Berosus and Manetho; and epigrammatists were numerous. Aratos indeed, the greatest of Alexandrine didactic poets, and Apollonius, the greatest epic poet of this period, have done nothing that they should be compared with 'classical' writers of hexameters. But it is not on its poetry that Alexandria can base its claims to our gratitude; it is on all that the librarians of Alexandria did to preserve the stores of classical literature.

Succeeding ages produced several respectable prose-writers—Pausanias the archæologist, Arrian 'the second Xenophon,' Josephus the historian—and two great prose-writers, Plutarch and Lucian; but in poetry they were yet more barren than the Alexandrine period. Again, a string of lexicographers and grammarians—Julius Pollux, Hesy-

chius, Suidas, Photius did valuable work on the classics. In fine, the post classical period was critical, not creative; it cared more for matter than for form, its poetry was based on classical models, and was generally frigid and pedantic, as its learning, though spent upon the classics, was not unfrequently pedantic and puerile; in two words, its chief features are imitation and annotation.

Compositions in modern Greek have been found dating from before the fall of Constantinople, but modern Greek literature is counted to have begun after 'the conquest.' For the first three centuries, however, we do not find prose works written in the modern language. We find poetical versions of Western romances, and we find the famous Klephtic songs, the songs of the Greeks who, rather than submit to Turkish rule, took to the mountains and lived a life of liberty, if of brigandage. But the prose works of this period are written in ancient Greek. If the rule of the Turk produced the songs of the Klephts, the dominion of Venice allowed of the production of poems which possessed more literary form though less poetical merit than the Klephtic chants. Such were the *Erotocritos* of Cornaro, an epic, or rather a pastoral poem, rather lacking in interest, and only occasionally relieved by a touch of imagination, and the *Erophile* of Chortakis, a tragedy defective in form, though containing lyrics of some value. In the 18th century poetry declined to a still lower level; and the honour of literature was chiefly maintained by the erudition of ecclesiastics, such as Lucaris, Miniatis, Meletios, Theotokis, Bulgaris. With the 19th century, however, began a new era in the history of modern Greek literature, and this was mainly the work of Corais (q.v.), himself the greatest name in the era which he inaugurated. Since his time the number of authors Greece has produced is strikingly large, some writing in modern, others in 'correct' Greek. Of them we may mention Panagiotis Sontsos, whose best work is contained in his dramas; Alexander Sontsos, the satirist; Rigas, the author of the song translated by Lord Byron, 'Sons of the Greeks, arise,' and of other poems which were the clarion whose notes still echoed in 1821 and first roused Greece from her slumbers; Villara, the lyric poet; Christopoulos, the Anacreon of modern Greek; Neroulos, the tragedian, distinguished for the fire of his imagination and the force and vigour of his diction; and last, the great scholar and still greater poet, A. R. Rangabé.

On the land of Greece, see W. M. Leake, *Travels in Northern Greece*, Wordsworth, *Greece*, Tozer, *Geography of Greece*, Lolling, *Hellenische Landeskunde und Topographie*, Bent, *Cyclades*, Freeman, *Studies of Travel in Greece and Italy*, Jebb, *Modern Greece*. On the history, works by Mitford, Thirlwall, Grote, Curtius, Holm, Cox, Smith, Evelyn Abbott, Duruy, Finlay (from the Roman Conquest, and Trikoupes, the War of Independence, in Romaic); Jevons, *Athenian Democracy*. On the literature, books by Muller, Cox, Mure, Mahaffy, Sittl, W. Christ, Susemihl, and the present author; and for modern Greek literature Rangabé, books by Miss Garnett (on folk songs) and Miss M'Pherson (poetry). For old Greek life, Becker's *Charicles*, and various works by Mahaffy. For the people of modern Greece, Rennie Rodd's *Customs and Lore of Modern Greece*, Miss Blunt's *People of Turkey*. See also the articles

Acropolis.	Corinth.	Music.	Philosophy
Architecture.	Ionic.	Mycenæ.	Poetry.
Art.	Greek [illegible]	Mythology.	Sculpture.
Athens.	Inscriptions.	Painting.	Theatre.

Greek Architecture. The origin of what is popularly called Greek architecture is, like the origin of every art and science in that country, mixed up with mythical and fabulous history. It is divided into three styles, and each of these has its mythical origin. Thus, the Doric is said to have been copied from the early wooden huts of the aborigines; the Ionic, which sprung up among the Greek colonists in Asia Minor, to have been modelled on the graceful proportions of the female figure, as the Doric had been on the more robust form of a man—the volutes representing the curls of the hair, the fluting the folds of the drapery, &c. The story of the origin of the Corinthian style is very pretty: a nurse had deposited in a basket on the grave of a departed child the toys she had amused herself with when alive. The basket was placed accidentally on the root of an acanthus, and in spring, when the leaves grew, they curled gracefully round the basket, and under a flat stone which was laid on the top of it. Callimachus, the sculptor, seeing it, caught the idea, and worked out at Corinth the beautiful capital since called after that city.

Modern discoveries, however, have shown that Greece owed much to the earlier civilisation of the countries which preceded it in history. To the architecture of one or other of these, almost every feature of Greek architecture can be traced. But it is for the first idea only that the Greeks are indebted to Egypt and Assyria; whatever forms they adopted, they so modified and improved as to transform them into a new style. The so-called Cyclopean or Pelasgian (q.v.) architecture was wholly unconnected with the evolution of any style of Greek architecture subsequently developed. Its remains consist mainly of tombs or 'treasure-houses'—underground chambers, vaulted with overlapping stones, and approached by a narrow passage descending to the entrance-doorway. The interior was sometimes ornamented with plates of bronze attached to the masonry. The entrance-doorway was of a conical form, the upper portion being sometimes filled with sculpture, as in the well-known Gate of the Lions at Mycenæ. The ancient cities and tombs of Greece have in recent years proved a rich field of research. Schliemann's excavations at Mycenæ and Tiryns have brought to light a great number of specimens of very ancient art in the form of terra-cotta work, gold and silver smiths' work, and carved stonework. Whether native or imported, these show a strong affinity with Assyrian and other Eastern designs. The later Greek art took its rise under the Dorians, after the return of the Heraclidæ about 1100 B.C.

Greek architecture proper is divided into three styles—the Doric, Ionic, and Corinthian (see COLUMN, figs. 4, 5, 6). Of these the Doric is the oldest. The earliest example which remains is the

Fig. 1.

temple at Corinth, which was built about 650 B.C. The remains of this temple show the various members of the style fully developed, but they are all of a massive and heavy description, strongly resembling in this respect their prototype the architecture of Egypt. There is now no doubt, although the intermediate steps are lost, that the Doric style

took its origin from the rock-cut tombs of Beni-Hassan (q.v.) in Egypt, of which fig. 1 is an existing example. The pillars of this tomb appear at first sight to be Doric; it is only on close inspection that we find that the echinus (see MOULDING) is wanting under the capital. The echinus was, however, used by the Egyptians. We here find ourselves in the cradle of Greek art; here we must seek for the primitive elements of the style, not in Greece, where the earliest example is already complete in all its parts. There, the earlier the example, the more massive is the form. This completely disproves the theory that the pillars were copies of stems of trees used as posts. In Assyrian and Hindu architecture evidence is preserved in the forms of the bracket capitals of the wooden origin of the pillars and beams, but in Greek architecture there are no such indications. It seems more likely that the first pillars in Egypt were square piers of rubble or brickwork, with a flat stone or tile laid on the top to form a good bed for the beams to rest on. The lintels or architraves are short and massive, and the pillars are placed close together, as would naturally be the arrangement in stone construction. It has been supposed that the triglyphs represent the ends of wooden cross-beams resting on the architrave. But when the principles of Greek construction are analysed it becomes apparent that the triglyphs have been employed as stone supports set upon the architraves for the purpose of carrying the cornice, the mutules or spaces between the triglyphs being sometimes left open, although generally filled with sculptured slabs. It is also to be observed that the triglyphs are used on the ends as well as the sides of the temple, where they could not represent the ends of cross-beams. The rafters were certainly of wood, and gave their sloping form to the pediment. It seems also likely that the ends of the rafters and projecting roof-tiles at the eaves may have suggested the detailed features of the cornice with its modillions. It will, however, be observed that although the mode in which stone is employed in Greek architecture is quite appropriate for that material when the space to be spanned is small, still the *principle* involved is the trabeate one, or that of beam construction, which is more applicable to wooden framing than to stonework, for which the arch is the proper medium both of construction and expression. The square form of the pier may have been afterwards modified by cutting off the corners, and again cutting off the remaining corners, until the polygon suggested the fluted shaft. The same process was afterwards gone through by the medieval architects in developing the piers of Gothic architecture. Be this as it may, the circular and fluted form of the column had been developed before it was adopted in Greece.

After the temple at Corinth, the next remaining example is the temple at Ægina (q.v.), built about a century later, or 550 B.C. There may have been many temples of the same date, but none now exist; they were probably destroyed during the Persian war, or removed to make way for finer edifices during the great building epoch of Greece which succeeded that war, and when she was at the zenith of her power. Of this epoch we have many remains. The temple of Theseus and the Parthenon at Athens (438 B.C.), those of Zeus at Olympia (440 B.C.), Apollo Epicurius at Bassæ, Minerva at Sunium, and all the best examples of the Doric style of Greece are of the age of Pericles. Besides the Peloponnesus, there are the countries colonised by the Greeks to which we can look for remains of Greek architecture. The Dorian colonists of Sicily and Magna Græcia carried with them the architecture of their native country, and furnish us with many fine examples. In Selinus there are six temples, the oldest being about the same age as that at Corinth. At Agrigentum there are three Doric temples, one of them founded by Theron (480 B.C.); this is the largest Grecian temple of the period, being 360 feet long by 173 feet broad. At Syracuse, Ægesta, and Pæstum there still remain valuable examples.

As the Doric art progressed, the early massive forms gave place to more elegant and slender proportions. In the temple at Corinth the column is only 4·47 diameters in height; in the Parthenon (fig. 2), which is universally recognised as the finest

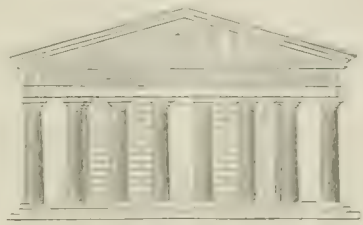


Fig. 2.

example of the style, the column is 6·025 in height; and in later examples it becomes still taller and thinner, until it runs into the opposite extreme from which it started, and becomes so meagre and attenuated as to lose entirely the boldness and vigour of design which are the chief characteristics of the style.

One thing to be particularly admired in the Doric style is the beauty of the sculpture with which it is adorned, and the appropriate manner in which the sculpture is placed in the building, and the building suited for the sculpture. Mr Penrose has endeavoured to prove by elaborate measurements and drawings that every line was the subject of the deepest study on the part of the architect, for the purpose of correcting and allowing for all optical aberrations. The result is that there is hardly a single straight line in the building; all the lines which *appear* to be perfectly straight are drawn with accurately calculated curves, so as to produce the smoothest and most pleasing effect to the eye. Every harsh angle is softened, and every disagreeable combination of lines avoided. For example, the columns instead of straight sides have an entasis or slight swelling formed by a hyperbolic curve; the architrave of the front is curved upwards, so as to correct the optical illusion caused by the sloping lines of the pediment, and the columns are sloped slightly inwards so as to give greater appearance of solidity. It must, however, be stated that in the part of Durm's *Handbuch der Architectur* (1881) which treats of Greek architecture, this extraordinary refinement of details is to a great extent denied. The Parthenon is built entirely of white marble, and the whole of the masonry in this, as in other Doric works of importance, is put together with the most perfect workmanship. There seems to be no doubt that this and other Greek temples were adorned externally with colour. To what extent this decoration was carried is not clearly ascertained; but it is probable that the exterior walls were covered with historical pictures, which were sheltered from the effects of the weather by the portico surrounding the temple. This colouring also served as a background against which the white-fluted pillars would stand well out. The sculpture was probably also relieved by a flat colour on the background, and the mouldings decorated with painted or gilded ornaments.

Ionic.—This style took its rise about 500 B.C., and as we have seen that the earlier Doric was

imported from Egypt, so the Ionic seems to have originated from the influence of Assyrian art. The discoveries of Layard and others have shown that many of the characteristic ornaments of the style were in common use in Assyrian architecture. The volutes of the capitals are particularly indicative of an eastern origin, the scroll being an ornament of very frequent occurrence in all eastern art. The finest examples of the Ionic style remaining in Greece are the temples of Wingless Victory (Athena Nike) and the Erechtheum at Athens, both about 450–420 B.C. In the Ionian and other colonies of Asia Minor also many fine specimens of this style were erected. The celebrated Temple of Diana at Ephesus was of the Ionic order. It was the largest temple we know of up to its time, being 425 feet long by 220 feet wide. The site was discovered and excavated by Mr Wood in 1869–74. The Ionic is a graceful and elegant style, but not so pure and severe as the Doric. The latter is distinguished by simple and beautiful outline, enriched with the most perfect sculpture; the former trusts rather to ornamental carving for its effect. This love of elaborate ornament is an indication of the eastern influence under which the style originated, and the mouldings and many of the ornaments are found to be borrowed from those of Assyrian architecture, only refined and simplified by the Greeks. The honeysuckle ornament (fig. 3), so commonly used both in Assyrian and Ionic architecture, is a good example of the improvement effected by the Greeks on the original type. In the Ionic as well as in the Doric, we find the most perfect execution and workmanship, the spirals, entasis, &c. being all drawn and cut with the greatest possible exactness.

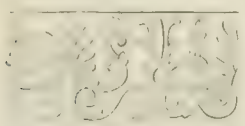


Fig. 3.

Corinthian.—This style was the latest introduced, and combines to some extent the characteristics of both the preceding. It unites and blends together the Egyptian and Assyrian elements, the cap being probably derived from the bell shaped capitals of the former country, ornamented with the carved leaves and spirals of the East. This order was first used about the time of Alexander the Great, the earliest example extant being the Choragic Monument of Lysicrates (335 B.C.). There are also the Temple of the Winds and that of Zeus Olympios at Athens, the latter being one of the largest and finest examples of the style. The Corinthian is the most florid of the Greek styles, and although invented by the Greeks, it was not brought into use till after the power of the republics, to which we owe the finest works of Greek art, had begun to wane. This style, from its richness and splendour, became afterwards the greatest favourite with the Romans, in whose hands Greek art spread over the whole empire.

Caryatides.—Besides the above styles, which constitute *the Greek orders* of classic writers, the Greeks also used *Caryatides* (q.v.), or female figures, in place of columns, as in the Erechtheum: and *Telamones* or giants, as at Agrigentum. These were probably derived from the figures used by the Egyptians in their architecture, but the latter never used them as columns; they always placed them as statues in front of the columns.

Fig. 4.

Greek temples are technically classed and designated by the mode in which the columns of the porticoes are arranged. The *cell*, or temple proper, is a square chamber contained within four walls; the simplest form of portico is called *distyle in antis* (fig. 4), the two side-walls being continued past the end-wall, and terminated with antæ, or pilasters, with two columns between. When the portico has four columns between the antæ, it is called tetrastyle. The temples have generally the same arrangement at both ends. In front of both ends of the plan *distyle in antis* (fig. 5), there is frequently placed a range of six columns, and from the flank columns a row is continued along both sides, thus forming a continuous portico all round the edifice. Such an arrangement is called *peripteral*, and the temple is designated hexastyle and peripteral. This was a common arrangement. The Parthenon is an exception to the general rule: it has a hexastyle portico at each end of the cell, in front of which is placed an octastyle portico, and seventeen columns at each side. The great temple at Agrigentum had seven columns at each end, and fourteen at each side, and was peculiar in having the space between the columns all round filled up with a wall. The reason probably was that the space between the columns was too great to be spanned by architraves in single stones. The wall was pierced with windows.

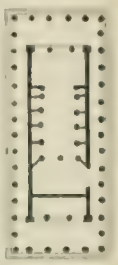


Fig. 5.

Considerable doubt has existed as to the mode adopted by the Greeks for lighting the interior of their temples; that suggested by Mr Fergusson seems the most probable, as being similar to the plan used by the Egyptians and Assyrians. The interior had generally a double row of columns, one over the other, dividing the width into three spans. This arrangement still exists in the Temple of Neptune at Pæstum. Fergusson supposes that the light was introduced by countersinking a part of the roof, so as to admit the light between the pillars of the upper range, thus forming a kind of clerestory, as shown on the annexed section of the Parthenon (fig. 6). Windows, however, were also used, as in the temple at Agrigentum and in the Erechtheum.

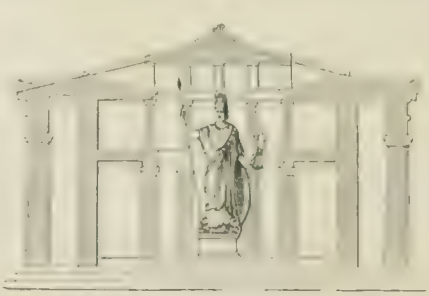


Fig. 6.

The theatres of the Greeks formed another very important class of works; they consisted of semicircular rows of seats cut in the rock, or partly built (see ATHENS). Remains of these structures are found in all the countries inhabited by the Greeks, and were frequently of great size—that at Dramyssus being 443 feet across. The proscenia were the parts on which architectural design was chiefly displayed; but these have unfortunately all perished.

None of the palaces or domestic edifices of the Greeks remain to us; we are thus totally deprived of a very interesting chapter in the history of domestic architecture, for it is highly probable that the houses of Greece, although not so splendid

and enduring as the temples, were more varied in style, and exhibited many picturesque and beautiful forms, which are now entirely lost. But from what is known of the jealous feelings which pervaded the republics of Greece, and from the aspect of the houses in the streets of Pompeii, we may conclude that the exterior appearance of the town-houses would be quite plain and unpretending, any richness or decoration being reserved for the interior.

The attempt was made in the early part of the 19th century to revive Greek architecture, and some ingenious modifications and adaptations of it have been carried out. But it was found that this style, so beautiful and appropriate in the warm and genial climate of Greece, was quite unsuited for our northern latitudes. The porticoes are useless in a climate where external painting cannot last, and where the sunshine is courted rather than excluded; the pitch of the roof is not high enough to throw off our snows; and windows of sufficient size for our dark skies are not admissible. Grecian architecture has therefore been abandoned; and its place is now taken by a style more appropriate to a northern climate, and more suited to the feelings of the people. See Fergusson's *History of Architecture* and other general works on the subject; *Antiquities of Ionia* (Dil. Soc. 4 vols. 1769-1881); *Athenian Architecture* (Dil. Soc. 1851; new ed. 1890).

Greek Church. THE (styled 'orthodox' by reason of its vindications of dogma, and 'Eastern' from its geographical distribution), is the church of those Christians who follow the ancient rite of the East and accept the first seven councils, but do not admit papal supremacy, and reject those innovations on the dogmas and the practice of the early church which were introduced by subsequent councils in the West. She is 'the aged tree beneath whose shade the rest of Christendom has sprung up:' and 'it is her privilege to claim direct continuity of speech with the earliest times, to boast of reading the whole code of Scripture, old as well as new, in the language in which it was read and spoken by the Apostles' (Stanley, *East. Ch.*). The dogmas of Christianity were first expounded by the Greek fathers; the earliest forms of Christian worship were composed by Greeks in Greek, and during the first five centuries the Eastern Church may fairly be said to have comprised the whole body of Christianity.

History.—The tendency and desire, natural to the Eastern mind, to endeavour to estimate and define in the abstract the attributes of Deity, pushed to extremes during a time of absorbing theological controversies, brought about, in the earlier period of the church, the formation of sects to which we shall hereinafter advert. But the great Schism between the eastern and western portions of Christendom, an event which has exercised abiding influence on the whole course of subsequent European history, was due to two primary causes—the inherent difference in the spirit and the traditions of East and West, and the transfer of the seat of empire from Rome to Constantinople.

As the Christian faith became predominant ecclesiastical jurisdiction necessarily coincided with civil government, so that, when the Council of Nicæa declared Rome, Alexandria, and Antioch to be patriarchal sees, it but recognised the political importance of those three centres of Christianity. As such, Rome was then the least important of the three. Indeed the early Roman Church was a colony of Greek Christians and Grecised Jews; the first popes themselves were Greeks, not Italians, and the very name of 'pope' is not a Latin name, but the Greek designation (*papas*) of every pastor of the Eastern Church. When, however, the seat of empire was transferred to Constantinople (330 A.D.), although Rome was thus deprived of its sovereignty and its courtly splendour, a signal opportunity for increase of power and self-assertion was given to the Roman pontiffs. Favoured by the absence in their diocese of theological controversies, such as distracted the East, and endowed for the most part with rare ability and worldly astuteness, they were not slow to seize upon and gradually appropriate the prerogatives and the civil authority of the absent emperors, and they soon arrogated to themselves even their pagan titles and military prestige. Constantinople, on the other hand, now rose rapidly to pre-eminence, not in the same sense of an ambitious ecclesiastical despotism, but as the official centre of a church already venerable, which had just received into its fold the first Christian emperor. A generation had hardly passed when Gregory Nazianzen (360) spoke of the city as a 'bond of union between East and West to which the most distant extremes from all sides come together, and to which they look up as the common centre and emporium of the faith.' It is true that, on the ground that 'Constantinople is the new Rome,' the second general council (381) assigned to it 'precedence of honour' next after Rome. But this declaration, and the subsequent decree of the fourth Council of Chalcedon (451), establish that these ecclesiastical honours were grounded upon the political distinction only to which both cities had successively risen. Jerusalem itself, in spite of its unrivalled associations, was included amongst the patriarchates—which thus reached the number of five—only at this latter council. Yet the initial advantages which the Greek Church already possessed never disappeared; they still subsist, 'a perpetual witness that she is the mother and Rome the daughter' (Stanley).

But other and irresistible inward causes militated against the maintenance of even outward unity. Rome was destined soon to detach herself from the sisterhood of patriarchates, and renounce even that venerated title. According as the political ties between the eastern and western halves of the empire grew weaker, antagonistic ideas seemed to guide the two rival sections of the church. In each the divergent genius of their pagan forerunners, no less than opposed local temperaments, reappeared with fresh vigour, and influenced both thought and action. The Greeks were still swayed, however unconsciously, by the liberal tradition of democratic Hellas; while the autocratic and centralising tendency of Rome never ceased to pervade the Latin pontificate. The fathers of the Greek Church inherited and christianised the philosophy of Plato and Aristotle; the Latin Church modelled its Christianity after Roman law. 'The East enacted creeds; the West discipline' (Milman). The one was controlled by a calm conservatism, the other was impelled by a restless desire for change. The one church remained ancient and catholic in spirit; the other was transformed into a medieval and Latin institution.

These contrasts, apparently superficial, were more deeply rooted and were fraught with weightier consequences than the outward theological differences which now mark the distinctions between other Christian churches. They were such as to lead to open rupture. Rome furthermore seemed again possessed by its traditional feeling of mingled jealousy and disdain for the Greeks, who were gradually becoming supreme at Constantinople, and who finally transformed the Roman empire into a Greek monarchy. Therefore, in the disputes which followed in quick succession, political considerations weighed more in proportion as the temporal power of the popes found sustenance in the gradual growth of an

independent confederation amongst the Italian states.

The first notes of disunion were sounded in Rome, by such innovations as the enforcement of clerical celibacy (385), followed by more or less peremptory demands for the recognition, first of the hierarchical, and later of the doctrinal supremacy of the Roman pontiff, which was ultimately to be admitted as 'by divine right.' Minor changes were gradually introduced into the Western Church, such as denying to priests power to administer confirmation, and the use of unleavened bread in the eucharist. These innovations the Greeks regarded as expressly designed to force upon them either a complete rupture or an unconditional submission to papal authority. But the chief and most abiding point of dogmatic difference consisted in the doctrine of the twofold procession of the Holy Ghost and the interpolation in the ancient creed of the church of the words *Filioque* ('and from the Son'). Without entering into the details of this interminable, hopeless, and bitter controversy, it may be safely said that the complete absence of such a doctrine from the deliberations of the early councils is not denied by the Latins; that popes, such as Leo III. and John VIII., admitted that its surreptitious insertion into the Creed was reprehensible; and finally, that the Greeks base their uncompromising reprobation of it on the explicit word of Christ: 'The spirit of truth which proceedeth from the Father' (John, xv. 26).

Such being the abundant sources of an estrangement which steadily increased, the pope was not at a loss for pretexts in hurling his first excommunication against the emperor and the patriarchs of Constantinople and Alexandria in 484. Thus the East and West were *de facto* separated for a period of nearly forty years. Efforts at conciliation followed, and successive excommunications were withdrawn to be renewed from both sides with intensified animus. But while the pope subordinated dogmatic differences to the recognition of his supremacy, the title of 'œcumenical,' which the emperor conferred on the patriarch of Constantinople, proved a fresh stumbling-block. The contest which followed (862) between the learned patriarch Photius and the popes Adrian I. and Nicholas I. was one of the most memorable periods of that long and eventful struggle, and although the so-called 'Photian Schism' was again compromised, the reconciliation proved neither cordial nor lasting. The same causes of difference, with others of a disciplinary nature, reappeared in the 11th century; and in 1054 Pope Leo IX. issued a formal excommunication against the patriarch Michael Cerularius. Since that time the separation has subsisted rigidly; for although more than one attempt was made by either side to restore intercommunion between the two churches, every effort failed before the unalterable demand for submission to papal supremacy and jurisdiction. Pope Gregory IX. conceded even the omission of *Filioque* by the Greeks, provided they burned publicly all books inimical to the Roman see; and the desire of many Greeks for reconciliation was so sincere that some sort of reunion might have been effected at a later time, if the old antipathies of East and West had not been rendered even more intense and irremediable through the conquest of Constantinople by the Latins in the fourth crusade (1204). The atrocities of this unprovoked and fanatical onslaught, which was instigated by the papal see, the outrageous desecrations of Greek churches, the horrors of the sack 'of a refined and civilised capital by a horde of comparative barbarians' (Stanley), and the cruel tyranny by which the Franks maintained their power, rendered the existing breach irreparable. The Frank invasion, by disorganising and weakening the Greek empire, opened the gates of Europe to the inroads of the Turks, whose rising power had carried before it everything in Asia. So that on his restoration to the throne of Constantinople (1261) the emperor Michael Palæologos, pressed by dangers, was compelled, on a promise of material assistance from the West, to submit to the dictates of Rome at the Council of Lyons in 1274. When, however, he endeavoured, at a synod held at Constantinople, to obtain ratification of that union, he failed to gain the assent of the body of bishops to what was a one-sided measure, resulting from political necessity. In the succeeding reign the breach was even more seriously widened by the councils held at Constantinople in 1283 and 1285. The last attempt at union was the one made by the Emperor John Palæologos, who, to save Constantinople, and with it the West, from the invasion of the Turks, appeared (1437) with the patriarch Joseph and several Greek bishops at the Council of Ferrara, better known from the place of its close as that of Florence. Protracted discussions took place on all the points at issue; but while received with marks of distinction and outward show of friendship, the Greeks were, as on former occasions, deceived, outreached, and entrapped into signing misleading and fraudulent documents, with the inevitable result that, even before their return to Constantinople, they renounced and repudiated the proceedings of what they characterised as one of the most scandalous of Roman conclaves. The capture of Constantinople by the Turks followed in 1453, and the fall of the Greek empire removed the political considerations which alone had dictated these latter attempts at reconciliation. Thus the Greek Church may be said to have died politically, but it has never surrendered its religious heritage.

Doctrines.—As already stated, the Greek Church receives the first seven œcumenical councils and the canons of the Trullan Council (from Τροῦλλος, the domed chamber of the imperial palace at Constantinople, where it was held). They adopt as their rule of faith not only the Bible, but also the traditions of the church '*maintained uncorrupted* through the influence of the Holy Spirit by the testimony of the Fathers,' amongst whom Basil the Great, Gregory Nazianzen, and St John Chrysostom are held in special veneration as 'the three hierarchs.' The Greek Church admits seven sacraments—viz. baptism, confirmation, penance, eucharist, matrimony, unction of the sick, and holy orders; but both in the acceptation and the use of them it differs widely from the Church of Rome. *Baptism* is administered by a triple immersion, in accordance both with the meaning of the term itself and with the indisputable practice of the early church. *Confirmation* (Μύρον or Χρῖσμα) follows immediately upon and in connection with baptism, even in the case of infants—again in obedience to apostolic precept. In the sacrament of *Penance* the church requires (*a*) admission before God of one's own sins, (*b*) faith in His mercy, (*c*) resolve of self-amendment: this confession to be made before a priest, (1) that he may offer spiritual guidance and admonition; (2) that he may announce to the penitent, in the name of Christ ('May the Lord absolve thee'), absolution and hope of salvation; (3) that he may recommend penitential work. 'Therefore the scandals, the influence, the terrors of the confessional are alike unknown in the East' (Stanley). As to the *Eucharist*, the Greeks admit the propitiatory sacrifice, the real presence of Christ, and transubstantiation, which, 'if used at all as a theological term, is merely one amongst many to express the reverential awe with which the eucharist is approached' (Stanley). They differ

from the Latins in the use of leavened bread and in the administration of communion in both kinds to all, even to children—this again in strict obedience to evangelical precept (John, vi.). *Marriage* is held to be dissoluble in case of adultery, but not till a probationary period has elapsed during which a bishop or priest mediates with a view to reconciliation. A fourth marriage is regarded as unlawful. *Unction* is administered not *in extremis*, as in the Latin Church, but in ordinary sickness, as laid down by St James (v. 14, 15), and is therefore called oil of prayer (Εὐχέλαιον). The sacrament of *Holy Orders* is celebrated by the observance of rites which have remained unchanged since the earliest times. With the exception of this last, all the sacraments may be administered by priests. The Greek Church not only reprobates clerical celibacy, but, although it has at all times favoured monastic orders, it requires that the parochial clergy should be married, so that they may not be cut off from the domesticity of the life of their flocks. Priests cannot marry after ordination, and consequently cannot contract a second marriage, nor may they wed a widow; but they must be married before ordination. Bishops are selected from the monastic orders, and are therefore single.

Monastic life originated in the East, and in countries of the Greek rite numerous convents of both sexes are established, most of which follow the rule of St Basil. The rule of St Anthony (the Egyptian hermit who first instituted Christian monasticism) prevails at Mount Sinai (established 527). This monastery, Jerusalem, and Mount Athos form the three great centres to which convents throughout the East are affiliated. According to their mode of life, monks are distinguished as (*a*) Ἀσκηταί, if leading the ascetic existence of hermits; (*b*) Ἀναχωρηταί, when living in retirement and in separate cloisters; and (*c*) Κοινοβιακοί, when assembled in a convent under an Ἡγούμενος or abbot. If several convents are subject to one abbot he is called Ἀρχιμανδρίτης, archimandrite; but bishops often hold the post of abbot. Nuns must either be virgins or widows, and they follow the rule of St Basil under an Ἡγουμένη, abbess. With both monks and nuns the duty of manual labour is a leading observance; the nuns, like their western sisters, apply themselves to the care of the sick and to the education of girls. But the chief glory of the Greek monastic institutions is that in them Greek learning and Greek nationality found refuge, protection, and succour during the long night of Turkish tyranny and Mohammedan persecution.

Worship and Liturgy.—Fasts in the Greek Church are many and rigorous. Besides four yearly fasts—the forty days of Lent, from Pentecost to the Feast of Saints Peter and Paul, the fifteen days before the festival of the Sleep of the Theotokos (August 15), and the six weeks before Christmas—Wednesdays and Fridays throughout the year should be observed. Indulgences are not recognised; and although prayers for the dead are practised they give rise to no ecclesiastical abuse. 'A general expectation prevails that, by some unknown process, the souls of the sinful will be purified before they pass into the Divine presence; but this has never been consolidated into a doctrine of purgatory' (Stanley). The Mother of our Lord is venerated, and homage (ὑπερδουλεία) is paid to her, but such homage has never been transformed into a dogma of immaculate conception; and the Greek Church speaks of 'the sleep' (κοίμησις) not the 'assumption' of the Virgin. Reverence (δουλία as distinguished from ἀληθινὴ λατρεία, actual worship) is paid to saints, and their *icons* freely adorn the churches; but, with the exception of the crucifix, no graven image is permitted. Instrumental music is forbidden in churches, but singing is universally in use. In public prayer the kneeling posture is used only at Pentecost; at ordinary times they stand, the body being turned towards the east, and the sign of the cross is frequently made during prayers. The ceremonial of the Eastern ritual is not inferior in splendour to that of the Western, but it is more solemn and archaic; though 'organs and musical instruments are as odious to a Greek or Russian as to a Scottish Presbyterian' (Stanley). Originally several liturgies were used in the East; but the liturgy of St James prevailed in the Greek Church. In its shorter form, as defined by St Chrysostom, it is read in churches throughout the year, with the exception of two or three festivals, when the longer version, attributed to St Basil, is said. This version is invariably used in convents. The Scriptures are in the hands of all believers, who are encouraged to study them in the vernacular, and although the idioms of some of the eastern churches into which the Bible as well as the liturgy were originally translated are now antiquated, 'the actual difference may be about that between Chaucer's English and our own.'

Hierarchy in the Eastern Church is thus defined in the catechism of Philaretus, which is in universal use in Russia: 'The four patriarchs, of equal dignity, have the highest rank among the bishops, and the bishops united in a general council represent the church, and infallibly decide under the guidance of the Holy Ghost all matters of faith and ecclesiastical life.' Thus the authority of the church is not despotic, centralised, or vested in one person. Each patriarch is independent in the exercise of his canonical authority, within his own diocese; but he is amenable to an œcumenical synod. The Greek clergy levy no tithes, claim no civil power over their flocks, and hardly possess any organisation as a separate body. 'The Eastern Church has never ruled that religious light and instruction are confined to the clergy.' And its strength 'reposes not so much on the power and influence of its clergy, but on the independent knowledge and manly zeal of its laity' (Stanley). The Eastern Church has become inactive since its subjection to Turkish rule. It is not a missionary church, and it abstains from proselytism. On the other hand, it never was intolerant, and its history has not been disgraced by persecutions, inquisition, or a St Bartholomew's massacre.

Relations with the Reformed Churches.—Owing to these reasons the early reformers turned their eyes to the Eastern Church in hope of support and eventual union. Melanchthon was the first to address a letter to the patriarch Joseph of Constantinople, through a Greek deacon, Demetrius Mysus, who visited Germany in 1558. Another Lutheran embassy, of a more formal character, headed by the well-known Tübingen divines Jacob Andreæ and Martin Crusius, visited Constantinople during the patriarchate of Jeremias (1576–81). Both missions were equally devoid of immediate practical results. But in the following century the celebrated Cyril Lucaris, a native of Crete, was educated in Germany, and was there imbued with the tenets of the Reformers. On assuming the patriarchate of Alexandria first (1602) and then of Constantinople (1621) he opened negotiations with the Calvinists with a view to union and the reform of the Greek Church; he corresponded with the English Archbishop Abbot and with Laud, and he presented the Alexandrian Codex (q.v.) to Charles I.; and in 1629 he issued a confession of faith of a decidedly Calvinistic tendency. But his efforts were bitterly opposed by the intrigues of the Jesuits, who brought about his deposition five times after successive reinstate-

ments in the patriarchal chair, and are supposed finally to have instigated his murder by the Turks. The innovations contemplated by Lucaris called forth a doctrinal declaration signed by the patriarchs of Constantinople, Alexandria, and Antioch, and defining the differences between the Greeks and the Reformers. This exposition was later (1672) adopted at a synod held at Jerusalem. But within our time the conciliatory spirit which animates these two branches of Christianity has found expression in practical measures of closer intercourse. In February 1872 the Greek bishop of Patras was present and delivered his benediction at the laying of the foundation-stone of an Anglican church in that town. And when later Lycurgus, the learned Archbishop of Syra and Tinos, and the Archbishops of Corfu and of Cyprus, visited England, they each attended Anglican services, and delivered their benediction in Anglican churches. But the most notable advance towards 'intercommunion' was made in 1859, and again in 1874, when the House of Convocation appointed a committee 'to establish such relations between the two communions as shall enable the laity and clergy of either to join in the sacraments and offices of the other without forfeiting the communion of their own church.' As a first step towards this end the patriarch of Constantinople issued an encyclical enjoining his clergy to bury deceased members of the Anglican Church in orthodox burial-grounds, and to celebrate their funeral rites with prayers taken from the funeral office of the orthodox church.

Sects.—The early theological controversies within the Greek Church itself, resulting in sectarianism, differ in this respect from the secessions from the Roman Church—that in the West the protest was directed mainly against abuse and ultramontanism, whereas in the East objections have always been raised against what was deemed innovation.

All the branches of the Eastern Church receive the first two councils, those of Nicea and Constantinople. But these two only are admitted by the *Chaldeans*, the earliest of Eastern separatists, whose dispute related to the meaning of *ἐνανθρώπησις* ('incarnation'). This doctrine gave rise to two distinct and opposed theories. The one accepted complete union of the human and the divine nature of Christ, and formed the belief of the *Monophysites*. The other maintained a separation of the two natures, so as to deny their co-existence in one person, and rejected the term *Theotokos* as applied to the Virgin Mary. Such were the tenets of Nestorius, whom the third Council of Ephesus (431) condemned, and after whom the Chaldeans are also called *Nestorians*. This sect spread rapidly throughout the interior of Asia, and became active in missions, not only to the neighbouring Persians and Indians, but to the Bactrians and Huns, as far north as the Caspian, to Samarkand and the very confines of China, and to Socotra, Ceylon, and the Malabar coast in the south. In this last locality a remnant of the former growth and power of this church still exists. They are the *Christians of St Thomas*, so called either from the apostle, or more probably from a Nestorian missionary of that name. Mussulman persecution, however, and the inroads of eastern barbarians have weakened, and at one time had almost annihilated, the Nestorians, who are now found principally in Kurdistan, and who believe themselves to be the lost tribes of Israel. Their sacred city is Edessa, the reputed birthplace of Abraham, and their 'catholikos' or primate assumes the title of 'Patriarch of Babylon,' his seat having been successively removed thence to Bagdad, Mosul, and Julamerk (or Giuliamerk), where he now resides. The Nestorian patriarch is the only Eastern prelate who may marry.

The tenets of the *Monophysites* were condemned by the fourth œcumenical council of Chalcedon (451), which established that Christ is to be acknowledged in two natures, 'indivisibly and unchangeably.' On this the larger portion of Syrian and Egyptian Christians, who had accepted the three former councils, seceded from the church, and soon broke up into three minor communities, largely through the influence of nationality.

In Syria the Monophysites were called *Jacobites*, from James the Apostle as they pretend, but more probably from Jacobus Baradeus, the Syrian heresiarch, since the name is equally applied to the other churches of the sect. The patriarch of the Syrian Jacobites bears in succession always the hallowed name of Ignatius, and resides at Diarbekir (the ancient *Amida*), on the right bank of the Tigris. The country beyond was originally under the charge of the 'Maphrian ("fruit-bearer") of the East,' so called from the fact that his was primarily a missionary see—it is now established at Mosul. This church, like the Nestorian, was formerly widespread and flourishing, extending to more than a hundred bishoprics, of which but five now survive.

The Jacobites of Egypt are better known under their national designation of *Copts* (q.v.), and form the great majority of the Christian population of northern Africa, as well as the most civilised of its native races. They have intercommunion with the Jacobites of Syria. Their patriarch, who takes his title from Alexandria, but resides at Cairo, claims jurisdiction over Jerusalem, Egypt, Nubia, Abyssinia, and the Pentapolis. He is elected by the body of bishops from candidates nominated by the four convents which possess this right. He alone has power of ordination, which is conferred, not by imposition of hands, but by the act of breathing.

A third branch of the great Jacobite communion is the *Ethiopian Church* in Abyssinia, where Christianity was first introduced in the 4th century by missionaries from Alexandria. The 'abouna' or metropolitan is, under the nominal supremacy of the Coptic patriarch at Cairo, primate of the Abyssinian Church, which presents an extraordinary combination of Christian and Jewish observances. Both baptism and circumcision are deemed necessary; both the Sabbath and Sunday are observed; polygamy is permitted, though not common; and the flesh of swine is forbidden. The old controversies as to the nature of Christ still continue in Abyssinia; and Pilate, because he washed his hands of the blood of Christ, is canonised by the Ethiopian Church.

The *Armenian Church*, which is often considered Jacobite, because it also receives only the first three councils, is, in all essential points, much more akin to the Church of Constantinople; and, indeed, the non-united section of the communion call themselves 'Orthodox.' The absence of the Armenian delegates from the Council of Chalcedon was due to the internal disorders of their country, but they were definitely separated from the Greek Church in 552. The Armenians were converted to Christianity by Gregory the Illuminator, and are therefore often called *Gregorians* (see ARMENIA). They, of all Christian churches, include as canonical Old Testament books the 'History of Joseph and Asenath,' and the 'Testament of the Twelve Patriarchs;' and in the New Testament the 'Epistle of the Corinthians to St Paul,' and 'Third Epistle of St Paul to the Corinthians.'

The decisions of the sixth œcumenical council held at Constantinople (680) resulted in the secession of the *Monothelites*, whose tenets as to the one will of Christ that council condemned. They included the Christian population of the Lebanon, who have since been better known as *Maronites*,

from St Maro, as they allege, the Syrian anchorite of the 5th century, after whom the famous convent near Cyrus is named, but more credibly from John Moro, their first patriarch in 701. Their primate is the patriarch of Kanobin. In the 12th century, however, by the influence of the Crusaders, the Maronites submitted (1182) to the Roman Church, of which they now form an integral part.

It is essential to observe that in each of the sects and churches so described there are, almost without exception, three divisions, resulting from the influence respectively of old traditions, nationalistic proclivities, and the Jesuit Propaganda. In each of these Eastern communions one should therefore distinguish (1) the 'Orthodox' section, with decided leanings towards the church of Constantinople; (2) the 'National' section, which maintains the independence of each particular heresy; and (3) the 'United' or 'Catholic' section, which acknowledges the supremacy of the pope.

Uniats or *United Greeks.* This last category forms an important fraction of the Greek Church itself. The fall of the empire facilitated the intrigues of the Roman Propaganda, which, especially after the Reformation, endeavoured actively to secure the submission to Rome of isolated Greek communities in the East; while, in the West, the influence of Catholic governments was brought to bear, to the same end, on the scattered Greek colonies, and on the outlying portions of the Greek Church. Thus, the numerous Greek and Albanian refugees from Epirus, who had settled in Sicily and southern Italy, were soon compelled to succumb; as also the indigenous orthodox populations in Austria and Poland—i.e. the Roumanians in Transylvania and eastern Hungary, and the Ruthenians in Galicia and Little Russia. The Polish Greeks, however, who had become 'Uniats' in 1590, reverted, for the most part, to the Russian Church in 1839. It is difficult to state exactly to what degree union has thus been attained. The primary, and in most cases, the only condition, was submission to papal supremacy; all else—clerical matrimony, communion in both kinds, church discipline, rites, and liturgy—being allowed to remain Greek. But when circumstances were favourable, more stringent conditions were gradually imposed. And therefore the 'Unia,' as the pact is styled, is not uniform in aught else but the unremitting efforts of the Propaganda to efface the individuality of these dismembered churches.

The Four Patriarchates.—The Mohammedan invasion submerged and curtailed the area, especially in Asia and Africa, over which the Eastern Church had spread; and the other vicissitudes to which reference has been made modified from time to time the extent of that area. Still, the four patriarchates claim jurisdiction within their original boundaries, with the exception of the independent states which were successively emancipated from Turkish rule.

The patriarchate of Constantinople includes the whole of European Turkey, Asia Minor and Pontus (Trebizond), and all the islands. The patriarchate of Antioch includes Syria, Phœnicia, Isauria, and Cilicia. This patriarchate, which at one time extended its influence to India and as far as China, has suffered most from the spread of Mohammedanism. The patriarchate of Jerusalem includes the whole of Palestine, and, prior to the Saracenic conquest, was one of the most flourishing, although the one established last (451). The patriarchate of Alexandria, once the most powerful and important, has shrunk, since the Mussulman occupation of Egypt, into the narrow limits of the see of that particular city.

The archiepiscopal see of Cyprus, which formed part of the patriarchate of Antioch, was raised to an independent position by the Council of Ephesus (431), and its primate, though inferior in rank to the patriarchs, has precedence over all other archbishops. He enjoys the exceptional privilege of affixing his signature in red ink.

The church of Constantinople is known as 'the Great Church' (Μεγάλη Ἐκκλησία), from its ancient pre-eminence as the see of the *œcumenical* patriarch—a title conferred by the emperor on John the Faster (587) against the remonstrances of Gregory I. The Church of Antioch claims to have been founded by St Peter, and that the similar pretensions of Rome are at once more recent and less certain. The name of Christians was first given to the believers in Antioch, and to its chief pastor alone the title of patriarch belongs by right. The patriarch of Alexandria is the first Christian primate who was styled 'pope.' His other title of 'œcumenical judge' arises from the right which the early Alexandrian Church possessed of fixing the period of Easter.

National Churches.—The authority which the Byzantine emperors exercised over the government of the Greek Church passed, with Constantinople, to the sultans. After the massacre which followed the capture of the city, and in which the patriarch had fallen with the emperor, Mohammed II. installed as patriarch George Gennadius, a Greek monk, renowned for his piety no less than for his scholarship, for which he was surnamed Scholarius. The courage and persuasiveness with which he expounded before the sultan the tenets of Christianity induced Mohammed to confer certain privileges on the patriarchate, enabling it to exercise a measure of authority over the orthodox church within Turkish dominions. This first concession constitutes to this day the charter regulating the relations of the church to the Porte. The patriarch is elected by a synod of bishops, but the candidate must be approved of by the Porte, which also issues firmans enabling the bishops to act within their dioceses. This gives to Turkish authority so effectual a control over the church, that its having survived at all is a proof of extraordinary vitality. But the abuse and scandal consequent upon the exercise of that authority was such as to make it the interest, both of the patriarchate and of the independent states which recognised its spiritual guidance, not to continue under a jurisdiction subjected to the sultan's will. Fortunately the constitution of the Eastern Church favoured the creation of autocephalous churches, which, while enjoying a separate internal administration, could remain bound to the Church of Constantinople and to each other by the unity of faith and dogma.

The *Church of Russia*, which alone of eastern churches presents historical continuity, was established when in 988 Anne, sister of the Emperor Basil, was wedded to Prince Vladimir, who was thus converted, and who at the same time ordered all his people at Kieff to be baptised in the Dnieper by the Greek clergy. From that time the Christian civilisation of Russia was Greek, from the alphabet which the Greeks adapted to the Slavonic language to the baptismal names of emperors and peasants alike; and Russia recognised this debt of gratitude by the powerful protection she has extended to the eastern Christians, amongst whom she is consequently known as 'Holy Russia.' The metropolitan, residing first at Kieff and later (1320) in Moscow, was subject to the patriarch of Constantinople. In 1582, however, with the concurrence of the whole church, the patriarch Jeremiah II. raised the Russian see to a patriarchate, still dependent on Constantinople. This dependency continued till the time of Peter the Great, who in 1700, again with the sanction of the whole body of eastern

patriarchs, suppressed the patriarchate of Moscow and confided the government of the Church of Russia to a synod composed of five or six bishops and a number of lay dignitaries, all appointed by the czar, who remained supreme head of the church. In Russia there are several dissenting sects.

The *Church of Georgia* (ancient Iberia) dates from the time of Constantine, when Nina, a Christian slave, converted the king and his people. It first formed part of the patriarchate of Antioch, and was subsequently transferred to that of Constantinople. But since the annexation of Georgia to the Russian empire the archbishop of Tiflis has been a member of the Russian synod.

The *Montenegrins*, who never acknowledged the suzerainty of the sultan, did not admit the jurisdiction of the Constantinopolitan patriarch. They were governed, since 1697, when they formally proclaimed their independence, by a 'Vladika' or prince-bishop of their own, chosen from the family of Petrović, and who exercised both spiritual and temporal power. In October 1851, however, Danilo I., on succeeding his uncle, the last Vladika, abandoned his ecclesiastical functions, and assumed the temporal title of hospodar or prince. The bishops of Montenegro have since been consecrated by the Russian synod.

In *Austro Hungary* there are over three millions of orthodox Christians, principally of the Servian and Roumanian nationality, besides four million Uniats. Of the former, who are there known as Byzantine Greeks, about half a million are scattered through the Austrian dominions, and the rest are in Hungary, with two archbishops (Carlowitz and Hermannstadt) and eight bishops, six in Hungary proper, and two in Croatia. The archbishops exercise their jurisdiction under Austria.

In *England* a Greek Church has existed since the middle of the 17th century. The periodical emigrations of Greeks to the west, consequent upon each fresh recrudescence of Turkish tyranny, resulted in the formation of a Greek colony in London, which must have been considerable both in numbers and position; for we find that many young Greeks were sent to Oxford, as a rule to St John the Baptist (Gloucester) Hall, where they replaced the Irish, who, after the establishment of Trinity College, remained in Dublin. A certain Nathanael Conopius, however, was at Balliol, where he first taught the Oxonians to make coffee, and whence he was expelled by the Puritans in 1648. When the Archbishop of Samos, Joasaph Georgirenes or Georgirenes, had to flee from his diocese, and arrived in England about 1666, he found amongst his co-religionists in London Daniel Bulgaris as priest, but there was no church. He therefore applied to the then Bishop of London, Henry Compton, who befriended him, and who with other English bishops collected a small fund, to which even King Charles II. is said to have contributed, for the erection of a Greek church on a piece of land in Crown Street, Soho Fields, given by the parish of St Martin-in-the-Fields. (See *A Description of the Present State of Samos, Nicaria, Patmos, and Mount Athos*, by Joseph Georgirenes, Archbishop of Samos; Lond. 1678.) This church, which was dedicated to St Mary the Virgin's Sleep, is still extant, and a marble tablet over the west door bears an inscription in Greek recording these facts, as well as the names then given to Greek Street and Compton Street in the same neighbourhood commemorate those events. The church, which is the one represented in Hogarth's well-known picture of 'Noon,' soon passed to the French Protestant refugees; it was subsequently fitted up as a meeting-house for the Rev. John Rees, and in 1850 it was reconsecrated as an Anglican church, to St Mary the Virgin (*Ecclesiologist*, xi. 120). A copy (made about 1760) of the original register, which seems to have perished, of that first Greek community exists in the chapel of the Russian embassy in London (Welbeck Street), and records the fact that when the Archimandrite Gennadius was priest in London, both the church and the community had become 'Greco Russian.' After the death of Gennadius (February 3, 1737), who was buried in St Pancras' Churchyard, the entries in the register record more and more frequent marriages between English and Greeks, who thus appear to have been absorbed by the indigenous element, their anglicised names which are still to be met with (Rodos, Pamphylos, Lesbos, &c.) confirming the fact. But in the beginning of the 19th century another Greek community sprung up in London by the arrival in 1818 from the island of Chios of three out of the five brothers Ralli, who founded the great firm of that name, and who were soon followed by others of their countrymen. They at first met at a chapel in one of the houses in Finsbury Circus, and in 1847 built a church in London Wall. As the community increased in riches and in numbers, this modest building was replaced in 1879 by a magnificent Byzantine church in Moscow Road, Bayswater, built after the model and bearing the hallowed name of 'Hagia Sophia.' Flourishing Greek churches exist also in Liverpool and in Manchester.

In the *United States* there are a Greek church in New Orleans and a Russian in San Francisco.

The *Church of Greece* offers a strong instance of the causes which militate against dependence upon a jurisdiction subject to the will of the sultan. The Greek struggle for freedom, which carried with it the active sympathy of the whole Greek nation, was, at the dictate of the sultan, put under the ban by the patriarch Gregorius, who, nevertheless, was soon afterwards hanged for complicity in the national cause. In the second year of the war the Assembly of the Greeks at Epidauros proclaimed (1822) the orthodox church as church of the new state, and the Royal Decree of 15-27th July 1833 organised the church on a plan similar to that of Russia, with a synod of five bishops, presided over by the Archbishop of Attica. A lay government commissioner attends the deliberations, but may not vote. The synod is the supreme ecclesiastical tribunal, and elects bishops under the confirmation of the crown. The clergy are excluded from all participation in politics, and are not eligible to sit in the legislature. In 1850 the patriarchate of Constantinople acknowledged the independence of the Church of Greece, which has already rendered to the other Greek-speaking churches great services in the education and training of priests. Of the large number of convents which existed in Greece, many were destroyed during the war of independence, and others have been utilised for educational purposes. Of those still extant the Meteora in Thessaly and Mega Spileon in the Peloponnesus are the most notable for extent and historical interest.

The *Church of Servia* existed, under the early Servian kings, as an independent church, with a patriarch at Belgrade (1300). The Turkish conquest disorganised that church, and, in 1679, 37,000 Servian families emigrated to Hungary under Arsenius Czernowitz, and established the see of Carlowitz. In 1765 the Servian patriarchate was suppressed by the Turks, and the Servian Church placed under the jurisdiction of the patriarch of Constantinople. When the semi-independence of Servia was achieved under Kara George (see CZERNY), in 1810, the government of the church was again transferred to the metropolitan of Carlowitz. Finally, in 1830, Servia declared her church autocephalous under the Bishop of Belgrade.

The *Church of Roumania* is the outcome of more violent and unfilial proceedings. The ecclesiastical administration of the two Danubian principalities of Moldavia and Wallachia was originally vested in the metropolitans of Jassy and Bucharest respectively, acting under the patriarch of Constantinople. The clergy in both principalities were almost exclusively Greek, few Roumanians having at that time either education or vocation for clerical life. The numerous conventual institutions in which they were assembled possessed immense landed estates, the bequests of Greek merchants and benefactors, who, through many generations adopted this as the only safe mode of endowing philanthropic and educational institutions within the reach of Turkish rule. Those estates, as well as others of an even greater extent and value in Russian Bessarabia (the revenues from which were sequestrated in 1873), furnished to the patriarchates of Constantinople and Jerusalem almost the only means of maintaining schools and hospitals throughout Turkey. When, however, the Moldo-Wallachians awoke to a sense of independent nationality and proclaimed the union of the two principalities under Alexander Couza (December 23, 1861), one of the first acts of the new Roumanian government was to sequestrate the Greek monastic property and declare the Roumanian Church autocephalous. It is now governed by the primate of Roumania, whose see is at Bucharest, with an archbishop of Moldavia at Jassy, and six bishops.

The *Bulgarians*, even before their political independence, had organised, for political purposes, a church of their own under an exarch. The Turkish government, anxious to foment disunion between its Christian subjects, encouraged the forcible appropriation by the Bulgarians of Greek churches and schools, and sanctioned their ecclesiastical policy. As, however, canon law does not admit of the co-existence within the same diocese of two separate churches of the same faith, the patriarch of Constantinople signified his readiness to acknowledge the independence of the Bulgarian exarchate, if its territorial limits were clearly defined, and if the exarch designated his see within those limits. This the Bulgarians refused to do, their avowed object being to extend their political influence through the exarchate, not only in mixed Græco-Bulgarian districts, but even over purely Greek dioceses. A general synod of the four patriarchs was therefore convened (1873) at Constantinople, and the excommunication of the exarchate followed. The Russo-Turkish war resulted in 1878 in the constitution of an independent Bulgarian state; but its ecclesiastical head, the Bulgarian exarch, continues to reside at Constantinople and to claim jurisdiction over the Bulgarians in Thrace and northern Macedonia also. He does not concede, however, to the patriarch of Constantinople a similar right over the Greeks in Bulgaria. The excommunication of 1873 is still maintained.

The total number of adherents of the Greek Church it is impossible to state precisely; the following are the only available reliable figures:

Orthodox Greeks.	
Russia	61,940,000
(Of these about 1½ million are dissenters.)	
Austria	493,000
Hungary	2,434,000
Greece	2,200,000
Roumania (about)	5,250,000
Bulgaria	2,007,000
Eastern Roumelia	734,000
Servia	1,939,000
Montenegro	232,000
Turkish Empire (approximately)	7,000,000
	234

Uniats.	
Russia	55,000
Austria	2,536,000
Hungary	1,500,000
Turkish Empire (approximately)	1,000,000

Sects.	
Nestorians	270,000
Jacobites	350,000
Maronites	250,000
Armenians –	
In European Turkey	380,000
In Asiatic Turkey	760,000
Abyssinians (about)	1,250,000

Literature. The first portion of this article is founded on Dean Stanley's admirable *Lectures on the History of the Eastern Church*, which have served as a basis to later treatises on the same subject. But the following authorities may also be consulted.—(1) *History*: Gibbon; Robertson; Gieseler's *Ecclesiastical History*, J. M. Neale, *History of the Holy Eastern Church*.—(2) *Controversies*: Dorner, *History of the Doctrine of the Person of Christ* (in Clark's translations); Swainson, *The Apostles' and Nicene Creed*; Walch, *Historia Controversiæ de processu Spiritus Sancti*; J. H. Newman, *The Arians of the Fourth Century*. W. Palmer, *Dissertations on Subjects relating to the Orthodox Communion*.—(3) *Councils and Canon Law*: Hefele, *History of the Councils* (Clark's translations); Photius, *Nomocanon* (Paris, 1615); G. A. Rallı and M. Potlis, Συνταγμα των θειων και των ἱερων κανονων (Athens, 1852-56).—(4) *Liturgy, Ceremonies, &c.*: E. Renaudot, *Liturgiarum Orientalium Collectio* (Paris, 1715-16); J. Goar, *Eucologium sive Rituale Græcum* (1647); H. A. Daniel, *Codex Liturgicus Ecclesiæ Orientalis* (1853); J. M. Neale and R. F. Littledale, *The Liturgies* (trans. 1869); H. A. Daniel, *Thesaurus Hymnologicus* (Leip. 1841-56); J. M. Neale, *Hymns of the Eastern Church* (trans. 1868); Kimmel, *Libri Symbolici Ecc. Orientalis* (Jena, 1843); J. Covell, *Rites and Ceremonies of the Greek Church* (1722); H. C. Romanoff, *Rites and Customs of the Greco-Russian Church* (1868); *Les Religions Anciennes et Modernes des Moscovites* (Cologne, 1698); Μηναιον and Συναξαριστης, for lives of saints.—(5) *Creeds and Condition of the Church*: D. Stourza, *Considerations sur la doctrine et l'esprit de l'Égl. Orthod.* (trans. from the Greek; Jena, 1816); A. N. Mouravieff, *Question religieuse de l'Orient et de l'Occident* (Moscow, 1856) and *Lettre à un ami sur l'Office Divin* (St Petersburg, 1850); Angeli (Ch.) Græci, *De Statu hodiernorum Græcorum* (Leip. 1671); Th. Smith, *De Gr. Eccl. hodierno Statu* (1698); P. Ricaut, *Histoire de l'État présent de l'Égl. Grecque et de l'Égl. Arménienne* (1692); Helladius (Alex.) Græcus, *De Statu presente Eccl. Gr.* (1714); T. Ellsner, *Beschreibung der Gr. Christen in der Turkei* (1737).—(6) *Hierarchy and Dioceses*: M. le Quien, *Oriens Christianus*, an account of the Eastern dioceses and their occupants from their foundation to 1732); *Philippi Cyprii Protonotarii Constantinopolitani, Chronica Eccl. Gr.* (1679); H. Hodius, *De Græcis illustribus* (1742); F. Cornelius, *Creta Sacra, sive de Episcopis in insula Creta* (Venet. 1755).—(7) *Relations with the Reformers*: G. Williams, *The Orthodox Church and the Nonjurors* (1868); *Eastern Church Association Papers* (1866-76).—8 *Uniats*: P. P. Rodota, *Dell Origine et Stato presente del Rito Gr. in Italia* (Rome, 1758).—(9) *Sects, &c.*: *Bibliotheca Orientalis* (Rome, 1719-28), by J. Simon Assemanni, a Maronite (contains list of MS. and writers of Syria, Arabia, Egypt, and Ethiopia); Simon, *Histoire critique de la Créance et des Coutumes des Nations du Levant* (1684; trans. in Eng. by Lovell, 1685); G. H. Badger, *The Nestorians and their Rituals* (1852); J. Wertabit, *Researches into the Religions of Syria* (1860); J. W. Etheridge, *The Syrian Churches* (1846); J. M. Vausleb (*Dominicain*), *Hist. de l'Égl. d'Alexandrie que nous appelons celle des Jacobites Coptes* (1677); M. La Croze, *Hist. du Christianisme d'Ethiopie et de l'Arménie* (1739); Harris, *Highlands of Ethiopia* (1844); Th. Wright, *Early Christianity in Arabia* (1855); J. G. Müllern, *Disputatio de Eccl. Maronitarum* (Jena, 1668); E. Dulaurier, *Histoire, Dogmes, Traditions, et Liturgie de l'Égl. Arménienne Orientale* (Paris, 1855); S. C. Malan, *Short History of the Georgian Church* (1866).

Greek-fire, a composition supposed to have been of pounded resin or bitumen, sulphur, naphtha (the principal ingredient), and probably nitre, with which, from about 673 A.D. onwards, the Greeks of the Byzantine empire were wont to defend themselves against their Saracen adversaries. The accounts of its effects are so mingled with obvious fable that it is difficult to arrive at any just conclusion as to its power; but the mixture appears to have been highly inflammable, and to have been difficult to extinguish; though the actual destruction caused by it was hardly proportionate to the terror it created. It was poured out, burning, from ladles on besiegers, projected out of tubes to a distance, or shot from balistæ, burning

on tow tied to arrows. The invention of this material has usually been ascribed to Callinicus of Heliopolis, and to the year 668 A.D. At Constantinople the process of making Greek fire was kept a profound secret for several centuries. The knowledge, however, of its composition gradually spread; and the use of it spread to the West. Subsisting for some time concurrently with gunpowder, it gradually died out before the advances of that still more effective competitor. Combustibles with a similar aim were used at the siege of Charleston in 1863, composed of sulphur, nitre, and lampblack; and naphtha in shells was also tried. The petroleum bombs of the Paris Commune of 1871 corresponded more nearly to Greek-fire than does gunpowder.

Greeley, HORACE, American journalist, described by Whittier as 'our later Franklin,' was born at Amherst, New Hampshire, February 3, 1811. His father was a small farmer, always poor; and Horace, the third of seven children, after acquiring the rudiments of education at a common school, entered a printing-office as an apprentice (1826), at East Poultney, Vermont, and rose so far as to assist in editorial work on the *Northern Spectator*. Released from his apprenticeship in 1830 by the suspension of this paper, he worked for some time as a journeyman printer in various country offices, and in August 1831 made his way to New York with ten dollars in his pocket, and his stick and bundle over his shoulder. He had difficulty in obtaining work at first owing to the oddity of his appearance. For fourteen months he worked as a journeyman printer, when he started business along with a fellow-workman, and in 1834 commenced the *New Yorker*, a literary weekly paper, for which he wrote essays, poetry, and other articles. His first marked success, however, was the *Log Cabin*, a Whig campaign paper which contributed largely to bring about the election of General W. H. Harrison to the presidency in 1840, and which was afterwards continued for some months. On April 10, 1841, he published the first number of the *New York Tribune*, of which he was the leading editor till his death. In the same year he merged his weekly papers, the *Log Cabin* and the *New Yorker*, in the *Weekly Tribune*, which rose to have a large circulation in the rural districts. The *Tribune* has been an earnest advocate of temperance, co-operation, international copyright, a protective tariff, the abolition of slavery and capital punishment, and other reforms; was at first Whig, then anti-slavery Whig, and was finally recognised as the organ of the extreme or radical Republican party. Greeley advocated and adopted to some extent the social theories of Fourier. Among the contributors whom he gathered around him were such well-known writers as G. W. Curtis, W. H. Fry, C. A. Dana, Margaret Fuller, and Bayard Taylor; while he was amongst the first American journalists to recognise the genius of Dickens, Bret Harte, and Swinburne. His business faculty was indifferent, and he was easily imposed upon by impecunious people and adventurers.

In 1848 Greeley was elected to congress by one of the districts of New York, to fill a vacancy, but failed in his congressional career by agitating an unwelcome reform in the mileage payments to members. In 1851 he visited Europe, and was chairman of one of the committees of the Great Exhibition. He was again in Europe in 1855. His aspirations to political position were defeated by the more conservative party leaders, and he, in turn, is supposed to have helped the nomination of Lincoln instead of Seward in 1860. On the secession of the southern states from the union, Greeley at first advocated their right to secede, as being in accordance with the principles of the Declaration of Independence; but when the war began he became one of its most zealous advocates, rival newspapers alleging that he caused the premature advance that resulted in the defeat of the government troops at Bull Run, July 21, 1861. He published an impressive anti-slavery appeal in the *Tribune*, entitled 'The Prayer of Twenty Millions,' which, besides making a profound impression, drew from Lincoln a remarkable letter; and within a month thereafter the emancipation proclamation was issued. After Lee's surrender he warmly advocated a universal amnesty; and his going to Richmond and signing the bail-bond of Jefferson Davis awakened a storm of public indignation. In spite of oratorical defects Greeley was a good and popular speaker. In religious faith he was a Universalist. In 1872 he was an unsuccessful candidate for the presidentship, receiving 2,834,079 of the popular vote, as against 3,597,070 for General Grant; the strain proved too great for him, and he died 29th November of the same year.—A town in northern Colorado, which he helped to colonise, was named Greeley. Greeley's works include *The American Conflict* (2 vols. 1864-66); *Recollections of a Busy Life* (1868); *Essays on Political Economy* (1870); *What I know of Farming* (1871). There are Lives by Parton, Reavis, and Ingersoll, and a memorial volume (1873).

Greely, ADOLPHUS WASHINGTON, Arctic explorer, was born at Newburyport, Massachusetts, 27th March 1844. He served as a volunteer through the war of 1861-65, and shortly after its conclusion entered the regular army as lieutenant, and in 1868 was placed on the signal service. In 1881 he was selected to conduct the American expedition to the head of Smith Sound, for the purpose of carrying on observations in pursuance of the international scheme arranged at Hamburg in 1879. He and the survivors of his party were rescued in June 1883, when at the point of perishing from starvation, after spending three winters in the Arctic north. Their sufferings were so extreme that some of the party had even been reduced to eating the bodies of the dead. Lieutenant Lockwood of this expedition travelled to within 396 miles of the geographical pole, the farthest point north hitherto reached. In 1887 Greely was appointed chief of the signal service, at the same time being gazetted brigadier-general. In 1886 he published *Three Years of Arctic Service*. See also W. S. Schley, *The Rescue of Greely* (1885).

Green, JOHN RICHARD, historian, was born at Oxford in December 1837, and had his education at Magdalen College School and at Jesus College there. The atmosphere of his native city had filled him, while still a boy, with sympathetic interest in the past, but the reading of Gibbon at sixteen shaped him into a historian. His earliest writing was a striking series of papers in the *Oxford Chronicle* on 'Oxford in the last Century.' He took orders, and was in succession curate and vicar of two East-end London parishes, where he gave himself with characteristic unselfishness and enthusiasm to the pressing social problems around him. Yet he snatched time from his busy life to pursue his studies and to contribute historical articles to the *Saturday Review*. In 1868 he became librarian at Lambeth, and next year he was struck down with an attack of consumption, a disease which darkened all his remaining years, and made any kind of active work hereafter impossible to him. Yet he toiled on with noble and uncomplaining heroism, and at last the instant popularity of his *Short History of the English People* (1874) justified the patience and endurance with which he had laboured to bring his work up to his own ideal.

It was the first complete history of England from the social side, and showed at once marvellous grasp of the real significance of great historic movements, fine sense of historical perspective and proportion, and startling dramatic force in the realisation of men and motives; while its style was fluent and unforced, yet ever vigorous and effective. His vast yet intimate topographical and antiquarian knowledge of England added life and truth to the narrative to a degree hitherto unexampled among English historians. The work attained an unparalleled success, as many as 150,000 copies having been sold within fifteen years. He issued also a larger and independent edition of the work as *A History of the English People* (4 vols. 1877–80); *Stray Studies from England and Italy* (1876), the fruit of his winters in Capri; and a *Short Geography of the British Islands* (1879), written in conjunction with his wife, and lightened up by his genius for topography. In 1879 he received the degree of LL.D. from the university of Edinburgh. He brought out in 1880 a selection of essays of Addison, with an introduction. He also prepared for Macmillan's educational series a selection of readings from English history, in three parts, and was general editor of their well-known series of historical and literary primers. In 1881 his feeble health finally gave way, yet he continued to the last his heroic struggle against hopeless disease, publishing in 1882 his *Making of England*, and leaving *The Conquest of England* to be edited by the pious care of his widow. His death took place in March 1883. His last two books are fragments of a projected history of England to the Conquest. See the admirable memoir prefixed to the 1888 edition of the *Short History*, by his wife (born 1849), who with Miss Norgate edited a richly illustrated edition of the *Short History* 3 vols. 1892–93). Mrs Green is the author of *Henry II.* (1888) and of *Town Life in the 15th Century* (1894).

Green, Mary Anne Everett, *née* Wood, was born in 1818 at Sheffield. She received an excellent education, and her culture was promoted by James Montgomery, the 'Bard of Sheffield.' In 1841 she removed with her parents to London, where in 1845 she married Mr G. P. Green, artist. Having free access to libraries and MS. collections, she edited *Letters of Royal and Illustrious Ladies* (1846); *The Diary of John Rous* (Camden Soc. 1856); *Letters of Queen Henrietta Maria* (1857). By appointment of the Master of the Rolls she calendared the papers of the reign of James I. (1857–59), and those of Charles II. (1860–68). She next completed the calendar of the state papers of Queen Elizabeth, with addenda from Edward VI. to James I. (6 vols. 1869–74), and edited the papers of the Commonwealth (12 vols. 1875–88), besides contributing to periodical literature. She died 1st November 1895.

Green, Thomas Hill, philosopher, was born at Birkin in the West Riding of Yorkshire, where his father was rector, April 7, 1836. At fourteen he was sent to Rugby, then under Goulburn's mastership, and in October 1855 he entered Balliol College, Oxford, where he was profoundly influenced by Jowett, Conington, and C. Parker. In 1859 he took a first-class in the school of *litteræ humaniores*, later a third in law and modern history, and in November 1860 was elected to a fellowship in his college, and re-elected in 1872, becoming also its first lay tutor in 1866. He married a sister of John Addington Symonds in 1871, was appointed in 1877 to be Whyte's professor of Moral Philosophy, and died after an illness of but eleven days, March 26, 1882. By his will he left £1000 to the university for a prize essay in the department of moral philosophy, £1000 to found a scholarship at the Oxford High School for boys, and £3500 to Balliol College for the promotion of higher education in large towns. Green's singularly noble character, contagious enthusiasm, and rare union at once of profundity and subtlety in philosophical speculation with strong interest in practical life and in social questions, drew around him a school of disciples that included many of the best men of his time at Oxford. His philosophy grew out of Hegelianism, but was strikingly original and vital in its form, no less than in its applications to the duties of everyday life. Thus, popular education and the spread of temperance were two objects that lay near his heart, and he gave himself with earnestness to the business of the Schools Enquiry Commission of 1864–66, and of the Oxford Schoolboard (1874), and helped to force on the Bribery Commission at Oxford to purge the political conscience of its citizens; because the natural conclusion of his philosophy was towards an association of individuals as homogeneous co-factors in the eternal spirit; the supreme and comprehensive rule of life being the law of love which binds men at once to human society and to God, society itself the necessary condition for the development of personality, and religion but the highest form of citizenship. He had written but little before he contributed in 1874 his masterly introduction to the Clarendon Press edition of Hume's *Treatise on Human Nature*. His *Prolegomena to Ethics*, left incomplete at his death, was edited by A. C. Bradley (1883), and two unusually pregnant 'lay-sermons' by Arnold Toynbee in the same year. His scattered essays in *Mind* and elsewhere were collected and published as the *Works*, by R. L. Nettleship (3 vols. 1885–88; 2 vols. philosophical; 3d, miscellanies and a memoir). His lectures on *The Principles of Political Obligation* appeared in 1895. See Fairbrother, *The Philosophy of T. H. Green* (1896).

Greenbacks. During the civil war in America, from 1861 to 1865, the immense expenditure of the United States government led to the printing of an unprecedented number of bank-notes, bonds, and currency papers of various kinds. These documents, from the colour presented by them, or some of them, obtained the name of *greenbacks*, a designation which came to be loosely used for all United States bank-notes. The first 'demand notes' were issued in August 1861; the first greenbacks proper were of date March 10, 1862. Soon forged notes and bonds were in circulation; but by degrees a large establishment was organised at Washington, under the immediate control of the Secretary to the Treasury, and the precautions used were such as almost completely to baffle forgers. The paper currency, whose value had fluctuated greatly, was declared convertible into coin on 1st January 1879, and specie payments completely resumed. For the manufacture of the notes from first to last, see Bank-Notes.

The great inflation of the currency during the war, along with the heavy demand for all sorts of farm-produce, brought a period of prosperity to the western farmers, which ended with the war itself. In 1867–68 the 'Ohio idea,' as the demand for an irredeemable paper currency was called, found much favour with the Democrats, especially in the West; and in 1874 an independent Greenback party held a convention at Indianapolis and formulated its demands. In 1876 the party nominated Peter Cooper (q.v.) for the presidency; he received ·97 per cent. of the popular vote. In 1880 the Greenback candidate was James B. Weaver, who polled 3·33 per cent.; and in 1884 General B. F. Butler was put forward, and received 1·33 per cent. of the popular vote. None of the candidates

ever received electoral votes. In 1888 there was no Greenback candidate, and of late the two sides on the currency question have been championed by B. Harrison (q.v.) and Mckinley (q.v.).

Green Bay, county-seat of Brown county, Wisconsin, is at the head of Green Bay, in Lake Michigan, and at the mouth of Fox River, 65 miles NNE. of Fond du Lac. It exports lumber and grain, and has a handsome Roman Catholic cathedral. Pop. 1890, 9069.

Greenbush, a town in New York State, on the other side of the Hudson from Albany (q.v.), so that it is sometimes called East Albany. Pop. 1890, 7287.

Green Cloth, Board of, a committee of the royal household of England attached to the department of the lord steward (see STEWARD), who presides over its deliberations. Its duties are to examine and pass all the accounts of the household, and to correct all offenders within the verge or jurisdiction of the palace, which extends to two hundred yards beyond the gates.

Greene, NATHANAEL, a famous American general, was born 27th June 1742, at Warwick, Rhode Island. His father was a leading preacher among the Quakers, and educated his son very simply, training him from childhood to work on his farm, and at his forge and grist-mill. By his own perseverance, however, Nathanael the younger acquired considerable knowledge of ancient and English history, geometry, law, and moral and political science; he was also fond of reading books upon war. In 1770 he was chosen a member of the Rhode Island Assembly, and, to the great scandal of his fellow Quakers, was among the first to engage in the military exercises preparatory to resisting the mother-country. In 1774 he enlisted as a private, and in 1775 he was appointed to the command of the Rhode Island contingent to the army around Boston, with the rank of brigadier-general. Promoted to be major-general, he distinguished himself at the engagements of Trenton and Princeton. At the battle of the Brandywine he commanded a division, and by his skilful movements saved the American army from utter destruction; and at Germantown he commanded the left wing, and skilfully covered the retreat. In 1778 he accepted the office of quartermaster-general, retaining the right to command in the field. In 1778 he fought at Monmouth Court-house; in 1780 he foiled Clinton at the Rahway bridges, was president of the board that condemned André, and, having resigned the quartermaster-generalship owing to the delays of congress in providing supplies, was appointed to Arnold's post at West Point.

In December 1780 he succeeded Gates (q.v.) in the command of the army of the south. Gates had just been completely defeated by Cornwallis, and Greene found the army in a wretched state, without discipline, clothing, arms, or spirit. By dint of great activity he got his army into better condition, and in January 1781, one of his lieutenants having nearly annihilated an English detachment, and this having drawn upon Greene the whole army of Cornwallis, much his superior in numbers, he made a masterly and successful retreat. On 15th March, having drawn Cornwallis more than 200 miles from his base, he forced on him a battle at Guilford Court-house, which resulted in a victory for the British, but one so costly that Greene was allowed to pass unmolested into South Carolina. The inland portions of this state and Georgia were rapidly reconquered, and fort after fort reduced, until, at the battle of Eutaw Springs, the war in the south was practically ended in what was virtually a victory for the Americans. Congress presented Greene with a gold medal in honour of this battle, and the Carolinas and Georgia made him valuable grants of land. When peace was restored in 1783 he returned to Rhode Island, where he received numerous testimonials of the public admiration. In 1785 he retired with his family to his estate at Mulberry Grove, Georgia, where he died of sunstroke, 19th June 1786. Greene was one of the very best generals of the war of independence, second, perhaps, only to Washington, whose close friend he was. See the Life by his grandson, Professor G. W. Greene (3 vols. 1867–71), and that by Capt. F. V. Greene (1893).

Greene, ROBERT, an English poet and dramatist, was born at Norwich about 1560. He was placed at St John's College, Cambridge, and took his degree of A.B. there in 1578. He afterwards travelled in Spain and Italy. On his return he re-entered the university, and took his degree of A.M. at Clare Hall in 1583. He was incorporated at Oxford in 1588. On leaving Cambridge he proceeded to London, where he supported himself by writing plays and romances. He led a very irregular life, but his literary activity was ceaseless. 'Glad was that printer,' says Nashe, 'that might be so blest to pay him deare for the very dregs of his wit.' His romances, many of which are written in Lyly's manner, are frequently tedious and insipid; but they abound in beautiful poetry. One of them, *Pandosto, The Triumph of Time*, supplied Shakespeare with hints for the plot of *The Winter's Tale*. The most popular of his plays was *Friar Bacon and Friar Bungay*, which has an interesting story, and (in spite of occasional lapses into bombast) is attractively written. As Greene helped to lay the foundations of the English drama, even his worst plays are valuable in the eyes of students; but his literary fame rests on the poetry which he scattered through his romances—some of his pastoral songs being unsurpassed for tenderness and natural grace. Though his life may have been dissolute, his works are singularly free from grossness. He died of the consequences of a debauch, 3d September 1592, and was buried next day in the New Churchyard, near Bedlam. On his death-bed he sent a most pathetic letter to his wife, whom he had deserted. After his death appeared the singular pamphlet entitled *The Repentance of Robert Greene, Master of Arts*, in which he lays bare the wickedness of his former life. His *Groat's Worth of Wit bought with a Million of Repentance* contains one of the few authentic contemporary allusions to Shakespeare. Chettle, in *Kind-Harts Dreame*, describes him as 'of face amible, of body well-proportioned, his attire after the habite of a scholler-like gentleman, onely his haire was somewhat long.' Greene's plays and poems were edited by Alexander Dyce; his complete works (15 vols.), with a biography from the Russian of Storojenko, are included in the Huth Library of Dr Grosart, who also edited a selection, *Green Pastures* (1894).

Green Earth, a mineral of a green colour and earthy character, often found filling or lining the vesicular cavities of crystalline igneous rocks, sometimes also disseminated through highly decomposed basic eruptive rocks, in which it is evidently a product of the alteration of such minerals as pyroxene, amphibole, biotite, &c. It consists principally of silica, alumina, magnesia, and protoxide of iron, the silica constituting about one-half. There are probably several minerals included under the 'green earth' of such igneous rocks. Some of these closely resemble Serpentine (q.v.) and others Chlorite (q.v.), in their general appearance.—*Glauconite* is the name given to the green earth which is not infrequently met with in sedimentary rocks, such as some of the sandstones

in the Cretaceous system. In such rocks glauconite occurs in the form of grains, which in many cases are casts of minute shells. The same material has been met with in the shells of recent rhizopods and in fragments of coral dredged up in deep water. There is also a green earth used as a pigment by painters in water-colours, who know it by the name of *Mountain Green*. For their use it is mostly brought from Monte Boldo, near Verona, and from Cyprus.

Greenfinch, or GREEN LINNET (*Ligurinus chloris*), a bird of the finch family (Fringillidæ), a common resident in most parts of Britain, frequenting gardens and copses and cultivated districts generally. It occurs in many parts of Europe, and extends its range into Asia, also visiting in winter such regions as North Africa, Asia Minor, and Palestine. The bill is much thicker than that of the true linnets, to which, however, it is nearly allied. A prevailing green tint, mingling with gray and brown, characterises the plumage, and gives the bird its name. The female is much less brilliant and somewhat smaller than the male, which measures about 6 inches in length. The nest, usually placed in shrubs, is somewhat loosely built of fibres, moss, hair, and the like; the eggs (four to six) are greenish-white, with brownish or gray spots; two broods are often reared in a season. The food consists of insects, seeds, and berries. The proper song of the greenfinch is not very sweet, but in confinement it readily imitates the song of other birds, and in consequence of this and of its very easy domestication it is rather a favourite cage-bird. See Howard Saunders, *Manual of British Birds*.

Greengage, a variety of plum, of a green or yellow colour and roundish shape, the *Reine Claude* of the French, generally esteemed as one of the finest varieties in cultivation, if not certainly superior to all others. It is not of the largest size, but in delicacy and richness of flavour it is unsurpassed. Some reckon it a variety of *Prunus insititia*, others as a distinct species, *P. italica*.

Greenheart, or BEBEERU (*Nectandra Rodiæi*), a tree of the order Lauraceæ, a native of Guiana, of great value as a timber-tree, and also yielding a valuable medicinal bark. The timber is commonly called *Greenheart;* the bark is better known as *Bebeeru* (*Bibiri*, &c., or *Sipiri*), and its alkaloid as *Bibirine* or *Bebeerine* (q.v.). The wood is extremely strong and hard, resembling lignum-vitæ. It takes a high polish. It is so heavy as to sink in water. It is remarkable for its durability, and for being almost exempt from the attacks of the white ants on land and of the teredo in water. It is much valued by harbour engineers, and is admirably adapted for all purposes which demand exceptional strength and durability. Its costliness, however, largely restricts its use, save for turning. Other species yield valuable timber, notably *N. concinna*, the 'Laurier marbré' of Martinique. The seeds of *N. Puchury* are used as a digestive tonic, and in diarrhœa and dysentery, especially in Brazil; they are known as Pichurim Beans (*Faba pichurim* of pharmacy).

Greenhouse. See PLANT HOUSE.

Greenland, an extensive region, stretching, so far as we know, from 59° 45′ to 83½ N. lat. and from 17 to 73° W. long., its north-eastern extremity, however, being not yet accurately defined. It may be taken for proved that it constitutes an island engirt by smaller islands, but an island of almost continental size. Even its southern end has a thoroughly arctic character. It was discovered by the earliest Scandinavian settlers in Iceland. After having been sighted by Gunbjörn, it was visited by Erik the Red, who, after having explored it, founded there in the year 986 two colonies, the Osterbygd and Westerbygd (Eastern and Western Settlements). The colonies afterwards came under the dominion of Norway, but were neglected and suffered from disaster and privation. Finally, the Westerbygd was attacked and destroyed by Eskimo intruders from the north some years after 1340. Subsequently the connection with Europe gradually grew less and less, until, according to obscure accounts, it wholly ceased after 1448, and Greenland almost passed into oblivion. When it was rediscovered by John Davis in 1585 the Eskimo were the only inhabitants. In 1721 the modern Danish settlements on the west coast were founded by Egede (q.v.) as missionary stations. During the three centuries since Davis's discoveries the question of the site of the ancient colonies, and the possibility of remnants of a Scandinavian population being found somewhere, have been the subject of much discussion; they have even given rise to several expeditions. Remarkable ruins of undoubted Scandinavian origin were early discovered on two points of the west coast, one in the present district of Julianshaab between 60° and 61° N. lat., the other in Godthaab between 64° and 65°. In each case the ruins lie scattered over an area of some hundred square miles, occupying small flat and fertile spots around the heads of the fjords. The southern group contains about one hundred such spots, each with ruins of from two or three up to thirty houses (possibly the old Osterbygd); the northern group is smaller. In 1885 it was proved conclusively that no ruins of a similar description exist on the east coast. The part of the Greenland coast still unknown is that between Cape Bismarck in 76½° N. lat. and Independence Bay in 81° 37′, discovered in 1891 by Peary, about half a degree south of the NE. corner of Greenland, which he was the first to reach, and which he visited again in 1895. In 1898 he planned an expedition to the North Pole to start from this corner of Greenland.

The whole coast-line of Greenland may be roughly estimated at 3600 miles, or 192,000, following every island, fjord, and peninsula. The area again may be variously estimated at 512,000 and 320,000 sq. m., according as one includes or omits the islands and fjords running inland, which are 60 miles long on an average. The interior of Greenland is of great interest with regard to physical geography in general. Owing to its size and continental character, it is the only known home on the northern hemisphere of real icebergs. Nearly half of the supposed circumference of the interior has recently been explored by a series of expeditions, whose results explain adequately how the icebergs are produced. It has been proved that a huge ice-sheet covers the whole of the interior like a deluge. The surface of this enormous glacier, only occasionally interrupted by protruding mountain-tops, rises slightly towards the interior. Several travellers have tried to penetrate into this unknown region, crossing the ice till they reached heights of 7000 feet; but it was not until 1888 that Greenland was crossed from east to west (by Nansen), when the 'divide' was found to attain some 10,000 feet above the sea. On account of this ice-cap Greenland has no rivers corresponding to its magnitude; instead of its being drained by rivers, the inland ice at certain points of the coast is thrust into the sea by forces which have their origin in extensive lateral glaciers in the interior. These points are represented by the so-called ice-fjords, of which six or eight of first-rate magnitude are found in Danish Greenland (between 67° N. lat. on the east coast and 75° on the west coast). Five of these have been narrowly explored, and it has been ascertained that the inland ice, which produces the bergs, and whose thickness may be

estimated at 1000 feet, is pushed on an average with a velocity of 50 feet in twenty four hours into the sea, where it breaks into fragments—the bergs. The mass thus annually delivered into one of the largest class of ice-fjords would be equal in size to a mountain more than 1000 feet high and covering 4 sq. m.

The coast margin that surrounds the ice-covered inland is by no means devoid of perpetual ice itself, but its glaciers are more or less isolated. It is very mountainous; bold headlands, 3000 to 5000 feet high, are common in the north as well as in the south, and some mountains even rise to a height of 6000 to 7000 feet. Low flat land is found only in small patches, especially round the heads of some of the fjords. These inlets generally take the form of narrow channels, frequently more than 1000 feet deep. During the summer the whole east coast, and the west coast up to 64° N. lat., are more or less encumbered with drift-ice from the Spitzbergen sea.

The climate of Greenland, when contrasted with the climate of the eastern coasts of the Atlantic in the same latitude, shows a surprising difference. The southern point of Greenland has a mean temperature like that of the most northern shores of Iceland and Norway. But the difference consists more in the want of summer than in the severity of the winter. The following figures give the approximate mean temperature in Fahrenheit respectively of the summer, the winter, and the year for three stations on the west coast: Lichtenau (60½° N. lat.), 44°, 22°, and 33°; Upernivik (73° N. lat.), 38·2°, – 6·6°, and 13·3°; Renselaer Harbour (78½° N. lat.), 33·4°, – 28·6°, and – 2·5°. The minimum observed in the north was – 66·5°; the maximum in the south 68°. On the east coast, in 74½° N. lat., the summer heat was about 40°, the winter – 10°; the maximum was 55·6°, the minimum – 40·4°. The mean temperature of the winter months on the west coast is very variable from one year to another, owing especially to a warm wind from south-east and east.

The mountains of Greenland consist chiefly of granitic and gneissose rocks. On the west coast, between 69° 15′ and 71° 20′ N. lat., they are interrupted by high tablelands, consisting of trap and basalt, accompanied by sandstone and slate, with beds of coal. The fossil flora discovered in connection with the latter exhibits 613 species, partly Cretaceous, with subtropical forms, partly Tertiary, indicating a climate like that of southern Europe. Metallic ores have hitherto proved rather scarce. Besides coal, different varieties of graphite have been discovered, but the only mineral of real economical value hitherto made use of is cryolite, which is exported for the manufacture of soda and a very pure alum. The mine is situated at Ivigtut (61° 10′ N. lat.). It is worked by foreign labourers, and the export is about 10,000 tons annually. A remarkable collection of different minerals occurs in close connection with the cryolite, comprising lead and tin ore, but only in small quantities. Another peculiar group of minerals occur in connection with eudialyte somewhat farther south; this mineral also has become an object of commercial speculation. A mineralogical rarity is finally the native iron, of which a mass found on Disco Island was estimated to weigh 46,200 pounds.

In sheltered slopes and valleys around the fjords south of 65° N. lat. copse-woods are found, consisting of alder, white birch, more rarely rowan-trees, which grow to 6 or 8 feet high. The highest birch discovered measured about 14 feet. Berries are abundant, especially crowberries and whortleberries. An attempt to grow potatoes at the southmost settlement failed. The Greenland flora comprises 395 species of phanerogams and higher cryptogams, and 330 species of mosses.

The fauna numbers 33 species of mammalia, 124 of birds, 79 of fishes. It is from the animal kingdom, especially from the seals and whales, that the natives derive almost their whole subsistence. The number of these animals annually killed in the Danish trading districts on the west coast is estimated as follows: *Phoca fœtida*, 51,000; *Phoca vitulina*, 1000; *Phoca grœnlandica*, 33,000; *Phoca barbata*, 1000; bladdernose seals, 3000; walrus, 200; white whales, 600; narwhals, 100; humpback whales, 1 or 2. Reindeer, of which 25,000 were shot annually in the years 1845–49, are now rather scarce. Of fish sharks only have any commercial value, but several other kinds afford food for the inhabitants. American ships have for some years tried halibut-fishery on the banks off the west coast. The dogs used for draught are of great importance in the north. A few goats and horned cattle have been kept by the Europeans, but more as a curiosity.

The inhabitants of Greenland (see ESKIMO) are of the Eskimo race, more or less mixed with European blood. The individuals of the mixed race hardly differ as to language and habits from the genuine Eskimo. Besides the natives, about 250 Europeans usually reside in the country, thirty to forty of whom have married native women. The number of natives, including the mixed race, was, in Danish West Greenland, 9648 in the year 1855, 9983 in 1886; in Danish East Greenland, 548 in 1884; the Smith Sound tribe may number 150; and lastly some few must be added for the imperfectly known north-eastern coast, where natives have been met with. The whole population in this way may amount to 11,000.

Since 1774 the trade of Greenland has been a royal monopoly; the service employs 2 inspectors, 30 agents and clerks, and 180 handicraftsmen, boatswains, and labourers, most of the latter being natives. There are 12 chief stations for trading and the Danish Mission; the southernmost is Julianehaab (60° 42′ N. lat.), the northernmost Upernivik (72° 48′ N. lat.). At Godthaab there is a seminary for training native catechists; of late, too, natives have been appointed pastors. The Moravian Mission has four chief stations. Since 1863 a municipal system has been tried, for which native representatives are elected by their countrymen. During the twenty years from 1853 to 1872 the annual export by the royal trade was 1185 tuns of oil and 40,000 skins, besides some eider-down, feathers, &c. In 1890–95 the exports and imports were each a value of between £25,000 and £30,000 a year.

Further information will be found in *Danish Greenland*, by the present writer (Lond. 1877), and the series *Meddelelser om Grønland* (Copenhagen, 1879–95), which give the results of investigations since 1876. As regards the rest of Greenland, our principal sources are, for the east, the works of Scoresby, Clavering, and the second German north polar expedition; information about the north-western part is scattered over the reports of several well-known Arctic expeditions, especially those by Kane, Hall, Nares, and Greely. See also Nordenskiöld's record of his exploration on the east coast and the interior (German, 1886), and Nansen's account of his expedition across the interior of southern Greenland in 1888.

Greenlaw, a small town of Berwickshire (q.v.), on the Blackadder, 38 miles ESE. of Edinburgh (by rail 55). Its court-house (1834) is a large Grecian pile. Pop. 744.

Greenlet Island, a small island in the Strait of Belle Isle, in 51° 34′ N. lat. and 56° 36′ W. long., the proposed landing-place of a Canadian Atlantic cable, to extend from near Clew Bay, in Ireland.

Green Mountains, a portion of the Appalachian Range. See APPALACHIANS.

Greenock, an important seaport of Renfrewshire, the seventh largest town in Scotland, on the southern shore of the Firth of Clyde, 3¾ miles by water S. of Helensburgh, and 22½ by rail WNW. of Glasgow. For more than four miles it stretches along the level strip of ancient sea-margin, or climbs up the slopes of the hills, which rise rapidly behind it to a height of 813 feet, and which command splendid views of the opposite coasts of Argyll and Dumbarton shires, fringed with white gleaming villages, of Highland mountains, and of the firth itself, stretching away into narrow sea-lochs, and dotted with every variety of craft. Greenock has a reputation of being always wet, and the yearly rainfall does exceed 60 inches; but as the prevalent winds are from the south and west, they are generally mild. The west end of the town, with its elegant and commodious villas of every style of architecture, its beautiful esplanade 1½ mile long, its wide and well-paved streets, planted with trees, is particularly attractive. The public buildings are many of them very handsome. The chief among these is the town-hall and municipal buildings (1886), Renaissance in style, with a tower 245 feet high; then come the county buildings (1867), the custom-house (1818), the poorhouse and lunatic asylum (1876), Wood's Mariners' Asylum (1851), the temperance institute (1870), the Y.M.C.A. Institute (1887), and the Watt Institution (1837), containing a marble statue of Watt by Chantrey. There are several handsome churches. To Sir Michael Shaw-Stewart the town is largely indebted for the Well Park (1851), the Wellington Park (1872), and the Lyle Road (1880). The new cemetery, 90 acres in extent, with its Watt cairn, and the magnificent water-works (1827–83) also deserve mention. The harbour-works date from 1707, and have cost upwards of 1½ million pounds. Accessible at all states of the tide, they include Victoria Harbour (1850), the Albert Harbour (1866), and the James Watt Dock (1886). The tonnage of vessels belonging to Greenock rose from 29,054 in 1825 to 103,919 in 1867, and 229,912 in 1888 (besides 306 fishing-boats); whilst the tonnage of vessels entering the port ranges between 1 and 1½ million per annum. Shipbuilding has been carried on since 1760; and during the twelve years 1876–87, the tonnage of vessels built here (mostly iron or steel steamers) varied from 14,500 in 1877 to 52,744 in 1882. Sugar-refining, commenced in 1765, in spite of bad recent years has still its chief seat at Greenock; and there are also manufactures of steam-engines, anchors and chain-cables, ropes, sailcloth, paper, wool and worsted, &c. Since 1832 Greenock has returned a member to parliament. Pop. (1696), 1328; (1801) 17,190; (1851) 36,689; (1881) 66,704; (1891) 63,423. Created a burgh of barony in 1635, Greenock owes its growth from a mere fishing-village to the Shaw family and to the Treaty of Union (1707), by which free commerce was opened up with America and the West Indies. Besides being the birthplace of Watt, of Spence the mathematician, and of Principal Caird, it has memories of Rob Roy, John Wilson, and Galt, and contains the grave of Burns's 'Highland Mary.' See Provost Dugald Campbell's *Historical Sketches of the Town and Harbours of Greenock* (2 vols. 1879–81).

Greenough, HORATIO, an American sculptor, was born in Boston, 6th September 1805, studied for two years at Harvard, and from 1825 spent the greater part of his life in Italy. His principal work, and one remarkable both for accuracy and for lofty conception, is the colossal statue of Washington, which now stands in front of the national capitol building. Other important sculptures are his 'Medora,' 'Venus Victrix,' and a group of four figures, 'The Rescue,' for the purpose of placing which he returned to America in 1851. He died suddenly at Somerville, Massachusetts, 18th December 1852.

Green Pigments. These are numerous and some are very important. Several of them are mechanical mixtures of blue and yellow; a larger number are chemical compounds which are naturally green; but of either kind only a few are extensively used. All those which are serviceable or have any special interest are noticed in what follows.

Sap green is the only one of vegetable origin that need be mentioned. It is prepared from the gummy juice of the berries of a species of buckthorn (*Rhamnus catharticus*), and is a fine transparent yellowish-green. It is unfortunately fugitive, but is occasionally employed in water-colour painting.

Terra verte is a kind of ochre. This pigment is much used by artists for painting in oil, being one of the most permanent greens. It has not much body, but can be mixed with other colours without injurious results.

Oxide of chromium, like the last, is found native, but for use as a colour it is always artificially prepared. It is a sober, permanent green much liked by some landscape-painters. *Viridian* and *Veronese green* are also oxides of chromium, but the latter is often adulterated with arsenic.

Emerald green (cupric aceto-arsenite).—This very bright (but poisonous) green, also called *Schweinfurt green* and *Paris green*, is employed to a limited extent by artists and decorators, and is used as an insecticide.

Scheele's green (cupric arsenite) is another bright green, although not so vivid in colour as the last, which it resembles in stability and in other properties. This is a dangerous pigment, and is unfortunately a good deal employed for colouring paper-hangings, artificial leaves, and toys.

Brunswick Green.—Several distinct pigments are known by this name. One of the kinds employed by the house-painter is a basic carbonate of copper, mixed with gypsum or other bodies. It is fairly permanent. Mountain green, mineral green, and malachite green are also carbonates of copper. In chemical books Brunswick green is usually said to be the oxychloride of copper. Chrome green, noticed below, is likewise called Brunswick green.

Rinman's green, known also as zinc green and cobalt green, consists of 88 per cent. of oxide of zinc and 12 per cent. of protoxide of cobalt. This colour is permanent, and is not affected by strong heat.

Chrome green is a mixture of chromate of lead and Prussian blue. It is a bright, strong colour, and is suitable for ordinary mechanical painting. It is, however, not permanent; a more durable green, but one of less power, being formed with French ultramarine and chrome yellow.

Hooker's green is a mixture of Prussian blue and gamboge, and possesses some permanence as a water-colour. *Prussian green* is formed in the same way, but contains more blue.

Greens which are compounds of copper are all more or less poisonous even when they do not also contain arsenic.

Artists generally prefer to make up the shade of green they require by mixing blue and yellow pigments for bright shades, and blue and brown colours for dull shades. As a rule the green portions of pictures have stood the effects of time worse than other colours.

For the materials used in dyeing textile fabrics green, see DYEING and CALICO-PRINTING; and for

green colours used in painting or printing pottery, see POTTERY.

Green River (1) rises in Western Wyoming, flows SE. into Colorado, and then SW. and S. through Utah, joining the Grand River, a branch of the Colorado, after a course of 750 miles. — (2) Green River, Kentucky, rises near the centre of the state, flows west and north-west, passing near the Mammoth Cave, and crosses the northern boundary, entering the Ohio 9 miles above Evansville, Indiana. It is about 350 miles in length, and is navigable for small steamers for 150 miles; its lower course is through the coalfields of Western Kentucky.

Greenroom, a room near the stage in a theatre, so called because originally painted green, where, during a performance, the actors wait while off the stage.

Greens, the common name of all those varieties of kale or cabbage (*Brassica oleracea*) which do not boll, and of which the leaves are used for the table as boiled vegetables; some of which are also called colewort, &c., whilst others, particularly those with curled leaves, as German greens, have no other name than greens or kale. Young unbolled cabbages, and shoots from the stocks of cabbages, are often also called greens, as well as turnip-tops, and other leaves of plants used in the same manner.— The leaves of German greens are very much waved or curled. This herb is one of the best kinds of *open* greens. It is either sown in spring and planted out soon after, or it is sown in autumn and planted out in spring.

Greensand, the name given to two divisions of the Cretaceous System (q.v.). They are so called from the occurrence in some of the strata of numerous small green specks of glauconite (a hydrous silicate of iron, alumina, and potash; see GREEN EARTH), sometimes so abundant as to give a green colour to them. The term is, however, far from being descriptive of the various included strata; it must be considered simply as a name. In some districts, especially on the Continent, the green particles are entirely absent from the strata. The petrographical character of the Upper Greensand is so like that of the Lower, that it is scarcely possible to separate them when the intermediate Gault is absent, except by their organic remains, which are very distinct; so much so, indeed, as to have caused the placing of the one series in the Lower Cretaceous group, and the other in the Upper.

The *Upper Greensand* consists of beds of sand and sandstone, generally of a green colour, with beds and concretionary masses of calcareous grit, called firestone, and chert. In the Wealden district the average thickness of the formation is about 60 feet. It is only doubtfully present north of Folkestone: in Sussex it reaches 20 feet, and in the Isle of Wight 100 feet in thickness. This formation is supposed to have been a littoral or shore deposit of the cretaceous sea. While the chalk was being deposited out at sea these sands were being laid down along the shore contemporaneously with the chalk, although they appear inferior to it. Their position would necessarily result from the cretaceous sea widening its area; as the shore was submerged the greensand became covered with the chalk, and thus appears as an older and underlying deposit. The beds of this series are rich in fossils, abounding especially in the remains of sponges, mollusca, and echinodermata.

The *Lower Greensand* consists chiefly of yellow, gray, white, and green sands, but includes also beds and bands of clay, limestone, and ironstone. It attains a thickness of 500 or so feet. The sands preponderate in the upper, and the clays in the lower portion of the formation. In Surrey, Kent, Sussex, &c. it is subdivided as follows:

4. Upper Greensand beds.
3. Sandgate beds.
2. Hythe beds.
1. Atherfield clay.

Some beds of clay of considerable thickness, occasionally as much as 60 feet, are used as fuller's earth. The calcareous stone is a highly fossiliferous band of limestone, locally called Kentish rag, much used for building in Kent and Sussex. The formation was formerly known as the iron-sand, because of the sands being cemented together by an abundance of oxide of iron; this gives them a reddish colour. The Lower Greensand contains numerous fossil mollusca and other remains. It is a marine-deposit, and rests on the fresh-water Wealden strata, showing that while it was being accumulated the sea made considerable encroachments on the land. In the Isle of Wight the strata are well developed, reaching a thickness of some 800 feet. In the Midland counties the same beds are recognised and have assumed various names, such as 'Faringdon beds,' 'Shotover sands,' 'Woburn sands and Wicken beds.' The Tealby series is the name given to the Lower Greensand beds of Lincolnshire. Near Flamborough Head the Lower Greensand and Wealden beds are represented by the Speeton clay.

Greenshank (*Totanus canescens*), a bird of the snipe family (Scolopacidæ), in the same genus as the redshank and some of the sandpipers. It is about the size of a woodcock (14 inches in length),

Greenshank (*Totanus canescens*).

but has much longer legs; the general colours of the plumage are brown and gray, the latter prevailing in winter, when the under surface is pure white; the bill is about 2 inches long; the tail is short. The greenshank nests on the ground, which the eggs (four) more or less resemble in colour; when disturbed the bird behaves and cries very much like a lapwing. The food consists of small animals of all sorts. In spring and autumn small flocks occur on the British coasts or by inland lakes; in Ireland it often winters, and in the north of Scotland may even breed. Its general range is virtually co-extensive with the eastern hemisphere. See Howard Saunders, *Manual of British Birds.*

Green Sickness. See CHLOROSIS.

Greenstone, a rock term (now disused) for any dark green basic crystalline 'trap-rock.' The greenish tint which such igneous rocks so frequently show is now recognised as being in most cases due to the presence of serpentine, chlorite, or other products of decomposition. Most greenstones are thus

referable to the Basalts (q.v.) and the Diorites (see IGNEOUS ROCKS).

Greenville, capital of Greenville county, South Carolina, on Reedy River, 95 miles (143 by rail) NW. of Columbia, with a cotton-factory, and manufactures of oil, flour, furniture, and machinery. It is the seat of a Baptist university (1851) and of a Baptist ladies' college. Pop. (1890) 8607.

Greenweed, a name given to certain half-shrubby species of *Genista*. See GENISTA, and Dyer's Broom (*G. tinctoria*) under BROOM. Hairy Greenweed (*G. pilosa*) is sometimes grown in France on light soils as fodder for sheep.

Greenwell, DORA, religious poet, was born 6th December 1821 near Lanchester in Durham, and after 1848 lived in Durham. She died 29th March 1882. Amongst her works, all marked by a lofty strain of patience, Christian hope, holy confidence, and withal of deep-seated melancholy, are a volume of poems in 1848, and another in 1861; several short prose works, including *The Patience of Hope*, *Two Friends*, and a sequel, *Colloquia Crucis;* a Life of Lacordaire (1868), and *Carmina Crucis* (1869). See the *Memoirs* by William Dorling (1885).

Greenwich (A.S. *Green-wic*, 'green creek or bay'), a parliamentary borough of Kent, is situated 5 miles ESE. of London Bridge, on the south bank of the Thames, here crossed by a steamship ferry, on the American system, which was opened in 1888. The town is chiefly memorable on account of its great national institutions. First amongst these comes Greenwich Hospital, which occupies the site of an old royal palace, in which Henry VIII. and his daughters Mary and Elizabeth were born, and where Edward VI. died. The first idea of its foundation is said to have originated in 1692 after the great naval victory of La Hogue; it was then proposed to raise a suitable monument as a mark of the gratitude which England felt towards her brave sailors. According to the Latin inscription which runs round the frieze of the hall, 'The pious regard of Queen Mary dedicated this Palace of Greenwich for the relief and maintenance, at the public expense, of those seamen who have protected the public safety in the reign of William and Mary, 1694.' The hospital consists of four distinct piles of buildings, all of which are quadrangular and named according to the respective sovereigns in whose reigns they were successively built. King Charles's building, to the west, was erected in 1664, from the original design by Inigo Jones. On the other side of the square towards the east is Queen Anne's building; to the southward of these are King William's building, containing the Great Hall, and Queen Mary's building, containing the chapel. The last three were from designs by Sir Christopher Wren. The Great Hall is remarkable for its painted ceiling, a work carried out by Sir James Thornhill in 1707–27. It contains several valuable pictures of great naval battles and of the heroes who fought in them; there is still preserved the coat which Nelson wore when he was shot at Trafalgar. The chapel is a fine specimen of Greek architecture; it was restored in 1789 from designs by James Stuart. A statue of George II. by Rysbrach adorns the central square.

The first pensioners were received in the hospital in 1705; these numbered 100; in 1814 the maximum number was reached—viz. 2710. In 1763 outpensions were granted from the funds; in 1849 the number of in-pensioners began to decrease, until in 1865 they only numbered 1400. For some time the in-pensioners had been discontented with their manner of living at the hospital, and in 1869, when they had the option of receiving a grant of money in lieu of their board and lodging, a very large majority preferred to take the money and go to their friends. A few old or bedridden men were transferred to the various naval hospitals and the Seamen's Hospital Society, to be maintained at the expense of Greenwich Hospital Fund. Greenwich Hospital was thus disestablished by the votes of the very men for whose benefit it was originally founded. The revenues of the hospital are derived from different sources, the principal of which are gifts by King William and the original commissioners, the rental of the forfeited estates of the Earl of Derwentwater, contributions of the seamen and marines of Her Majesty's fleet, as well as from those who served in the mercantile marine; large sums have been acquired from unclaimed prize-money and fines. The annual income of the hospital is £167,259. From this sum numerous pensions are paid; 1000 boys, the sons of seamen and marines, are maintained and educated at Greenwich Hospital Schools at an average cost of £23,000 a year; gratuities are granted to widows of seamen and marines; and 50 children of officers who have died receive grants for their education. It is estimated that 9000 persons, exclusive of the children mentioned, derive benefit from the funds. In 1873 Greenwich Hospital became the college for the Royal Navy, and all naval officers belonging to the combatant branch are now compelled to take their degree at Greenwich. Having reached a certain seniority as midshipmen, they are entered at the college, and, after having passed through a course of instruction, they are examined and classified according to merit. Executive officers of different ranks have the privilege of studying and earning extra distinctions by passing meritorious examinations. A certain number of the engineer officers also go through a course of study at the Royal Naval College.

The Naval Museum contains many objects of interest connected with the navy, such as models of ships both ancient and modern, specimens of guns, torpedoes, and ammunition, plans of British dockyards, relics of Sir John Franklin's expedition, and, last but not least, the famous original Chatham chest—established at Chatham by Queen Elizabeth in 1588 for the relief of wounded and decayed seamen, and removed hither in 1803.

The Royal Hospital School was first established in 1712 for the purpose of clothing and educating the sons of the pensioners. One thousand boys enjoy its benefits, besides one hundred day-scholars nominated under the Boreman Trust. Entries are made at 11 years of age, and, if the boys prove fit for service in the navy, they are retained till they reach the age of 15½ years. The school is essentially a training place for the Royal Navy, the boys being passed thence to training-ships at Portsmouth and Devonport. The 'Queen's House' in the centre of the school buildings was a favourite residence of Queen Henrietta Maria. The school possesses a spacious gymnasium, a large swimming-bath, several good model rooms for seamanship instruction, and a very fine dining-hall. The admissions are limited to the sons of seamen of the Royal Navy, the Royal Marines, and the Royal Naval Reserve, with a few from the mercantile marine.

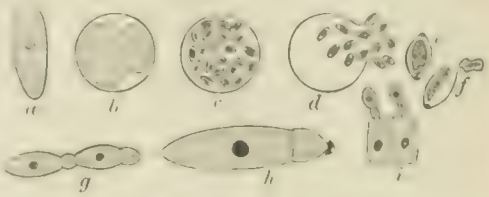
Another national institution at Greenwich, not less important than these naval establishments, is the Royal Observatory, which crowns the hill that rises in the park behind the hospital (see OBSERVATORY). It was built by Charles II. in 1675, the first astronomer-royal being Flamsteed. From here the correct time is flashed every day by the electric telegraph to the principal towns of the kingdom. From Greenwich, too, geographers and seamen reckon longitude. The park is a favourite

resort of Londoners on Sundays and holidays. The Whitebait (q.v.) Dinner, a banquet held by the cabinet ministers to celebrate the termination of a parliamentary session, is held at Greenwich, which is famous for the fish from which the dinner is named. Greenwich is well supplied with charitable institutions, chief among which may be mentioned the Jubilee Almshouses, Norfolk or Trinity College, Roan's Charity, the Green-coat and Blue-coat Schools. The manufacturing establishments of the town include engineering, telegraph works, chemical works, &c. It returned two members to parliament down to 1885, when the new parliamentary boroughs of Deptford and Woolwich were formed out of its boundaries, and it was restricted to one member. Pop. (1881) 65,411; (1891) 78,131. See the Rev. A. G. L'Estrange, *The Palace and the Hospital: Chronicles of Greenwich* (2 vols. 1886).

Greg, William Rathbone, author of several works in literature and politics, was born in Manchester in 1809, became a Commissioner of Customs in 1856, and acted as Controller of Her Majesty's Stationery Office from 1864 to 1877, when he resigned. He died November 15, 1881. He was a man of profoundly earnest character, had a conspicuous power of incisive writing, and was interested in many philanthropic measures. In his *Rocks Ahead* he took a highly pessimistic view of the future of England, and regarded some present tendencies as pregnant with danger, anticipating with foreboding the political supremacy of the lower classes, the approaching industrial decline of England, and the divorce of the intelligence of the country from its religion. His works include *The Creed of Christendom* (1851); *Essays on Political and Social Science* (1854); *Literary and Social Judgments* (1869); *Political Problems* (1870); *Enigmas of Life* (1872; 18th ed. with memoir by his widow, 1891); *Rocks Ahead, or the Warnings of Cassandra* (1874); *Mistaken Aims* (1876); *Miscellaneous Essays* (2d series, 1884).

Gregarinida, or Sporozoa, a class of parasitic single-celled animals or Protozoa. As adults they are entirely destitute of cilia or other locomotor structures, and emphasise in their history the encysted phase of cell-life. They are found in almost all kinds of animals, inside the cells, or loose in the alimentary canal, body-cavity, and other spaces. The food consists of the diffusible albuminoids of the host, absorbed by the general surface of the 'mouthless' unit. The Gregarine is wholly surrounded by a rind, and sometimes shows fibril-like, probably contractile, structures; there is a large spherical nucleus, but no contractile vesicle. They vary greatly in size, from minute forms which live within blood corpuscles to others visible to the unaided eye, and measuring sometimes $\frac{1}{12}$th of an inch. A typical life-history is indicated in the diagram, the important points being as follows: in early life the Gregarine usually lives inside a cell, whether it keep this habitat or not; the young forms not unfrequently divide; Gregarines are fond of associating in couples (or even in trios), but this union does not seem to be usually followed by fusion; at a certain stage the unit, or sometimes the pair, becomes encysted and divides into numerous clothed spores; each of these, when liberated by the bursting of the cyst, gives origin to a young Gregarine, or usually to several; these are at first flagellate or amœboid, or at least more active than the adults, but with nutrition and growth the juvenile activity is soon lost.

Among the most important Sporozoa are the following: Monocystis, represented by at least two species in the male organs of the earthworm; Gregarina, a type of those with the body divided by a partition, and furnished with a curious, anterior, proboscis-like appendage, found in the alimentary canal of crustaceans and insects—e.g. lobster and cockroach; Klossia, in molluscs, especially cuttle-fish; Drepanidium, in frog's blood, a



Life-history of Gregarine:

a, encysted adult type, showing rind, nucleus, and protoplasm; *b*, two individuals [illegible]; *c*, the [illegible] is; *d*, the [illegible] several worm-like bodies, or falciform spores; *e*, one of the spores [illegible]; *f*, a young form developed from a spore, showing two encysted spores; *g*, a young form developed from a spore, [illegible] end; *h*, an adult, showing attaching anterior portion and the slightly [illegible] end; *i*, two young Gregarines encysted in the cell in which they have spent their early life.

type of many with a similar habitat in birds and reptiles. Very imperfectly known are the Myxosporidia found in fishes—apparently very primitive forms—and the Sarcosporidia in the muscle-fibres of mammals, of which Sarcocystis ('Miescher's vesicles' or 'Rainey's corpuscles') is common, but apparently harmless in butcher-meat. *Coccidium oviforme* is definitely known as a Gregarine parasitic in man.

See Cell, Parasitism, Protozoa; also Bütschli, 'Protozoa' in Bronn's *Thierreich*; Balbiani, *Leçons sur les Sporozoaires* (Paris, 1884); Lankester, *Parasites of Man* (Edin. 1886); Lankester, art. 'Protozoa,' *Encycl. Brit.*; Schneider, *Tablettes Zoologiques* (1886, &c.); Hatchett Jackson's ed. of Rolleston's *Forms of Animal Life* (Oxford, 1888).

Grégoire, Henri, the most remarkable among the so-called constitutional bishops of France, was born of poor parents at Vého, near Lunéville, December 4, 1750. Educated by Jesuits at Nancy, he took orders, and lectured for some time at the Jesuit College of Pont-à-Mousson. His *Essai sur la Régénération des Juifs* (1788) breathed the toleration that was in the air, and became widely popular. Becoming curé of Emberménil, he was sent to the States-general of 1789 as one of the deputies of the clergy. He was an ardent democrat in all his views, and, attaching himself from the first to the Tiers-état party, acted a prominent part throughout the grand drama of the Revolution. One of the secretaries of the National Assembly, he supported enthusiastically the abolition of the privileges of the nobles and clergy alike, and the civil constitution of the clergy. He was the first of his order to take the oaths, and was elected the first 'constitutional bishop' of the department of Loir-et-Cher, which he accepted, although the old and legitimate bishop, Monseigneur de Thémines, was still alive. Grégoire carried into every department the stern democracy to which he was devoted, and which he identified with the Christian brotherhood of the gospel; and upon the fundamental doctrine of the Revolution—the rights of man—he sought to ingraft his own early advocacy of the Jews and of the negroes, and especially the doctrine of the duties of man. At the blasphemous Feast of Reason, the weak Gobel, constitutional Bishop of Paris, publicly renounced Christianity; but Grégoire faced the infuriated rabble with all the courage of the primitive martyrs, and refused to deny his Master. After the 18th Brumaire he became a member of the Corps Legislatif. His

extreme republicanism was highly distasteful to Bonaparte, and it was only after a third attempt that he was appointed member of the senate. On the conclusion of the concordat between Pius VII. and Bonaparte he ceased to exercise ecclesiastical functions, being unable conscientiously to give the retractations required by the church, and he died without reconciliation at Auteuil, near Paris, 28th May 1831. His *Mémoires* were edited by H. Carnot, with a life (1831). Of his numerous writings may be named *Histoire des Sectes Religieuses* (1814); *Essai historique sur les Libertés de l'Église Gallicane* (1818). See the studies by Krüger (Leip. 1838) and Böhringer (Basel, 1878).

Gregorian Calendar. See CALENDAR.

Gregorian Tones. See PLAIN-SONG.

Gregorovius, FERDINAND, a distinguished German historian, born in East Prussia, 19th January 1821. He studied theology at Königsberg, but soon devoted himself to poetry and literature. In 1852 he settled in Rome, where he died 1st May 1891. His great work is the *History of the City of Rome in the Middle Ages* (8 vols. 1859–72; translated from the 4th German edition, vols. i. and ii. 1895). He wrote also on Italian geography and history, on Corsica (1854), Capri, and Corfu, on the graves of the Popes (1857; 2d ed. 1881), on Lucrezia Borgia (1874), on Urban VIII. (1879), on Athens (1889), and on the Byzantine empress, Athenais (3d ed. 1891); also a tragedy on the death of Tiberius (1851), and an epic, *Euphorion* (6th ed. 1891).

Gregory, the name of sixteen popes, of whom five were specially noteworthy.

GREGORY I., THE GREAT, a father and saint of the Roman Catholic Church, was born in the city of Rome about the middle of the 6th century. His father Gordianus was a senator of the same family as that to which Pope Felix III. had belonged, and his mother Sylvia was famed for her surpassing virtues. At a comparatively early age Gregory was appointed by the Emperor Justin II. to the important charge of prætor of Rome; but he voluntarily relinquished this office, and withdrew altogether from the world into a monastery at Rome, one of seven he had founded. 'He lavished on the poor all his costly robes, his silk, his gold, his jewels, his furniture, and not even assuming to himself the abbacy of his convent, but beginning with the lowest monastic duties, he devoted himself altogether to God.' This was probably about 575. It was while here that he saw one day some fair-haired Anglo-Saxon youths in the slave-market—'non *Angli* sed *angeli*'—and was seized with a longing to devote himself to the conversion of their country to Christ. He set forth on his journey, but the clamour of the Romans at his loss led the pope Benedict to compel his return, and eventually to enrol him in the secular ministry by ordaining him one of the seven Regionary Deacons of Rome. Benedict's successor, Pelagius II., sent Gregory as nuncio to Constantinople, to implore the emperor's aid against the Lombards. He resided three years in Constantinople, during which time he commenced, and perhaps completed, his *Moralia*, an exposition of Job. On his return to Rome he resumed his place as abbot of his monastery, and on the death of Pelagius, in a plague which laid waste the city, was unanimously called by the clergy, the senate, and the people to succeed him. He used every means to evade the dignity, even petitioning the Emperor Maurice to withhold his consent, but was forced to yield, and was consecrated September 3, 590.

Few pontiffs have equalled, hardly one has surpassed, Gregory I. as the administrator of the multiplied concerns of the vast charge thus assigned to him. 'Nothing,' says Dean Milman, 'seems too great, nothing too insignificant, for his earnest personal solicitude; from the most minute point in the ritual, or regulations about the papal farms in Sicily, he passes to the conversion of Britain, the extirpation of simony among the clergy of Gaul, negotiations with the armed conquerors of Italy, and the revolutions of the Eastern Empire.' There is no department of ecclesiastical administration in which he has not left marks of his energy and his greatness. To him the Roman Church is indebted for the complete and consistent organisation of her public services and the details of her ritual, for the regulation and systematisation of her sacred chants. The mission to England, which he was not permitted to undertake in person, was entrusted by him, with all the zeal of a personal obligation, to Augustine; and, under his auspices, Britain was brought within the pale of Christendom. Under him also the Gothic kingdom of Spain, long Arian, was reconciled with the church. Nor was his zeal for the reformation of the clergy, and the purifying of the morality of the church, inferior to his ardour for its diffusion. His letters, which are numerous and most interesting, are full of evidences of the universality of his vigilance. On the occasion of the threatened invasion of Rome by the Lombards he showed himself in act and in influence, if not as yet in avowed authority, a temporal sovereign. Against the memory of his administration of Rome a charge was formerly made, that in his zeal against paganism he destroyed the ancient temples and other buildings of the pagan city. But Gibbon confesses that the evidence is 'recent and uncertain;' and, indeed, the only authority to which Gibbon himself refers, Platina, simply mentions the charge in order to repudiate it. Though Gregory had a contempt for mere letters, and thought the oracles of God were above the rules of grammar, it is not true that he burned the Palatine Library in his hatred of pagan literature. As regards the general government of the church, Gregory reprobated very strongly the assumption by John, patriarch of Constantinople, of the title of Ecumenical or Universal Bishop, the more especially as the object of John in assuming this title was to justify an exercise of jurisdiction outside of the limits of his own patriarchate. In his writings, too, the details of the whole dogmatical system of the modern church are very fully developed. His *Letters*, and, still more, his *Dialogues* abound with miraculous and legendary narratives, which, however uncritical in their character, are most interesting as illustrating the manners and habits of thought of that age. With all his zeal for the diffusion of Christianity, Gregory was most gentle in his treatment of heathens and Jews, and he used all his efforts to repress slave-dealing and to mitigate the severity of slavery. He died March 12, 604. Besides his *Moralia* he left homilies on Ezekiel and on the Gospels, the *Regula* (or *Cura Pastoralis*), and the *Sacramentarium* and *Antiphonarium*. In exegesis he is a fearless allegorist. The best editions of his works are the Benedictine (4 vols. folio, 1705) and that in Migne's *Patrologia* (vols. lxxv.–lxxix.).

See the studies by Lau (1845) and Pfahler (1852); Rev. J. Barmby's little book in the 'Fathers for English Readers' (1879); Kellett, *Gregory the Great* (1889); the monograph by Abbot Snow, O.S.B. (1892); and Zöpffel's article in Herzog-Plitt's *Real-Encyklopädie*.

GREGORY II., by birth a Roman, was elected pope in 715. His pontificate is specially noticeable as forming an epoch in the progress of the territorial pre-eminence of the Roman see in Italy. The eastern emperors having almost entirely abandoned the government and, still more, the defence of Italy, and the aggressions

of the Lombards becoming every year more formidable, the imperial authority in the West sank into little more than a name; and the tyrannical and barbarous measures by which the Emperor Leo the Isaurian attempted to enforce his decrees against image worship weakened still more the tie which bound Italy to the eastern emperors. The natural result of the diminution of the imperial authority in Italy was the growth of that of the pope, to whom the deserted Italian provinces looked, partly as their spiritual counsellor and head, partly as their mediator with the barbarous enemy, partly as the centre of the political federation for self-defence which their very isolation necessitated. Gregory convened a council in Rome on the subject of the honour due to images, and addressed a very energetic letter to the emperor, protesting against the sacrilegious outrages of which he had been guilty, explaining and defending the Catholic doctrine on image-worship, and warning the emperor that the feelings of his subjects were so completely alienated by his conduct that it was only the pope's influence which prevented them from throwing off all allegiance. Gregory has been accused of himself fomenting this disaffection. The contrary, however, is attested, not only by his own letters, but also by Paul the Deacon, in his *History of the Lombards* (book vi. chap. 39); and it is quite certain that the circumstances themselves, and the well-known character of the emperor, would sufficiently explain any degree of discontent in Italy. At all events, the result of the contest was a most notable aggrandisement of the political authority and influence of the popes in Italy. Gregory II. was distinguished by his zeal for the evangelisation of heathen lands; it was under his auspices that the famous Winfried or Boniface entered on his missionary work in Germany. He died in 731.

GREGORY III., a native of Syria, succeeded Gregory II. in 731. In the same year he hurled the anathema of excommunication against the Iconoclasts, and the retaliations of Leo the Isaurian did much to weaken the ancient tie between the popedom and the empire. The encroachments of the Lombards in Italy during his pontificate became so formidable that, as the eastern emperors still remained powerless or indifferent to the protection of the Italian provinces, the Romans charged Gregory to send a deputation to Charles Martel, soliciting his succour against the enemy, and proposing upon that condition to recognise him as their protector, and to confer on him the title of consul and patrician of Rome. This offer was made by the pope 'in virtue of a decree of the Roman primus,' and is of great historical importance in the consideration of the nature and origin of the papal power in Italy. The embassy failed, owing to the pressure of his war with the Saracens, to enlist the aid of Charles; but it was a step towards the consummation of the independence of the West. Gregory III. died in 741.

GREGORY VII., pre-eminently the historical representative of the temporal claims of the medieval papacy, was born, about 1020, at Soana, a village in the southern border of Tuscany. Whether his family belonged to the burgher or the noble class is disputed by his biographers. His family name, Hildebrand, would imply a Teutonic descent; but by birth and education at least he was Italian. His youth was passed at Rome, in the monastery of St Maria, on the Aventine, of which his uncle, Laurentius (afterwards Bishop of Amalfi), was abbot. From Rome he passed into France, where he entered the celebrated monastery at Clugny, in the schools of which he completed his education; and from the strict ascetic observances there practised by him he acquired those habits of austerity which distinguished his whole life. He visited the court of Henry III., and obtained by his preaching the reputation of great eloquence. On his return to Rome he became the chaplain of Gregory VI.; but after the death of that pontiff he again withdrew to his former retreat at Clugny, from which he was only recalled by the earnest appeal of the new and zealous pope, Leo IX., whom he accompanied to Rome in 1049. Under this active and devoted pontiff Hildebrand exercised great influence. He now for the first time received holy orders, and was eventually created cardinal. Besides the responsible domestic employments which were assigned to him, he was sent as legate to the important Council of Tours, in which the cause of Berengarius was examined. Under all the short but important pontificates of the successors of Leo IX., who are known in history as the German popes—Victor II., Stephen IX., Benedict X., and Alexander II.—Hildebrand continued to exercise the same influence, and by inspiring into their government of the church the great principles to which his life was devoted he prepared the way for the full development of his theory of the papacy.

He was unanimously elected at Rome, without awaiting the imperial authorisation, three days after the death of Alexander II. The German bishops, who feared the effect of those reforms of which his name was a guarantee, endeavoured to prevent the Emperor Henry IV. from assenting to the election; but Henry gave his approval, and the new pope was crowned, July 10, 1073. From the date of his election the pontificate of Gregory was one life-long struggle for the assertion of the principles with which he believed the welfare of the church and the regeneration of society itself to be inseparably bound up. Regarding as the great evil of his time the thoroughly secularised condition of the church in a great part of Europe, and especially in Germany and northern Italy, he directed against this all his efforts. The position occupied by the higher clergy as feudal proprietors, the right claimed by the crown of investiture with the temporalities of benefices, the consequent dependence of the clergy upon the sovereign, and the temptation to simony which it involved were, in the mind of Gregory, the cause of all the evils under which Europe was groaning; and of all these he regarded Investiture (q.v.) as the fountain and the source. While, therefore, he laboured by every species of enactment, by visitations, by encyclical letters, and by personal exhortations, precepts, and censures, to enforce the observance of all the details of discipline—celibacy, the residence of the clergy, the instruction of the people—and to repress simony and pluralism, it was against the fundamental abuse of investiture that his main efforts were directed. In the year after his election he prohibited this practice, under pain of excommunication both for the investor and the invested, and in the following year he actually issued that sentence against several bishops and councillors of the empire. The Emperor Henry IV. disregarding these menaces and taking the offending bishops under his protection, Gregory cited him to Rome to answer for his conduct. Henry's sole reply was a haughty defiance; and in a diet at Worms in 1076 he formally declared Gregory deposed from the pontificate. The pontiff was not slow to retaliate by a sentence of excommunication; and in this sentence, unless revoked or removed by absolution in twelve months, by the law of the empire at the time, was involved the forfeiture of all civil rights, and deposition from every civil and political office. Henry's Saxon subjects appealing to this law against him, he

was compelled to yield, and by a humiliating penance, to which he submitted at Canossa (q.v.) in January 1077, he obtained absolution from the pope in person. This submission, however, was but feigned; and on his subsequent triumph over his rival, Rudolf of Swabia, Henry resumed hostilities with the pope, and in 1080 again declared him deposed, and caused to be appointed in his place the antipope Guibert, Archbishop of Ravenna, under the name of Clement III. After a protracted siege of three years, Henry, in the year 1084, took possession of Rome. Gregory shut himself up in the castle of St Angelo. Just, however, as he was on the point of falling into his enemy's hands, Robert Guiscard, the Norman Duke of Apulia, entered the city, set Gregory free, and compelled Henry to return to Germany; but the wretched condition to which Rome was reduced obliged Gregory to withdraw first to Monte Cassino and ultimately to Salerno, where he died, May 25, 1085. His dying words are a deeply affecting but stern and unbending profession of the faith of his whole life, and of the profound convictions under which even his enemies acknowledge him to have acted—'I have loved justice and hated iniquity; therefore I die an exile.'

The character of Gregory VII. and the theory of church-polity which he represents are differently judged by the different religious schools; but his theory is confessed by all, even those who most strongly reprobate it as an excess, to have been grand in its conception and unselfish in its object. 'The theory of Augustine's city of God,' says Milman, 'no doubt swam before his mind, on which a new Rome was to rise and rule the world by religion.' In his conception of the constitution of Christian society the spiritual power was the first and highest element. It was to direct, to command the temporal, and, in a certain sense, to compel its obedience; but, as the theory is explained by Fénelon, by Gosselin, and other modern Catholics, the arms which it was authorised to use for the purpose of coercion were the arms of the spirit only. It could compel by penalties, but these penalties were only the censures of the church; and if in certain circumstances temporal forfeitures (as in the case of Henry IV.) were annexed to these censures, this, it is argued, was the result of the civil legislation of the particular country, not of any general ecclesiastical law. Thus, in the case of Henry, the imperial crown was forfeited, according to the Swabian code, by the mere fact of the emperor's remaining for twelve months under excommunication without obtaining absolution from the sentence. Moreover, whatever may be said of the power in itself, or of the lengths to which it has at times extended, the occasion and the object of its exercise in the hands of Gregory were always such as to command the sympathy of the philosophical student of the history of the middle ages. By his firm and unbending efforts to suppress the unchristian vices which deformed society, and to restrain the tyranny which oppressed the subject as much as it enslaved the church, he taught his age 'that there was a being on earth whose special duty it was to defend the defenceless, to succour the succourless, to afford a refuge to the widow and orphan, and to be the guardian of the poor.' Dean Milman sums up his history of Gregory VII. as of one who is to be contemplated not merely with awe, but in some respects, and with some great drawbacks, as a benefactor of mankind.

See Milman's *Latin Christianity* (vol. iii.); Giesebrecht, *Geschichte der Deutsch. Kaiserzeit* (vol. iii.); Bowden, *Life of Gregory VII.* (1840); Voigt, *Hildebrand als Papst* (2d ed. 1846); Gfrorer, *Papst Gregor VII.* (7 vols. 1859–61); W. R. W. Stephens, *Hildebrand and his Times* (1888); and the studies by Soltl (1847), Villemain (1872; Eng. trans. 1873) Langeron (1874), and Meltzer (1876). His whole literary remains are included within seven books or *Registers* of letters, which have been often printed.

Gregory XIII., Ugo Buoncompagno, was born at Bologna, January 7, 1502. He was educated in his native city, where he filled the chair of Law for several years. Having settled at Rome in 1539, he was distinguished by several important employments, and was one of the theologians of the Council of Trent; on his return thence he was created cardinal in 1565, and sent as legate to Spain. On the death of Pius V. Gregory was elected pope in 1572. Not one among the post-Reformation pontiffs has surpassed Gregory XIII. in zeal for the promotion and improvement of education; a large proportion of the colleges in Rome were wholly or in part endowed by him; and his expenditure for educational purposes is said to have exceeded 2,000,000 Roman crowns. The most interesting event of his pontificate, in a scientific point of view, is the correction of the Calendar (q.v.), which was the result of long consideration, and was finally made public in 1582. Under his care was published also a valuable edition of the *Decretum Gratiani* with learned notes. He was a zealous patron of the Jesuits, and supported the League in France against the Huguenots; and it was he who ordered a *Te Deum* in Rome on occasion of the massacre of St Bartholomew, and had a medal struck in honour of the occasion. He strongly supported Philip II. of Spain in his designs against England; and he left the mark of his energy on almost every department of church life and work. He died in 1585, in the eighty-third year of his age.

Gregory, St, surnamed Illuminator (Armenian *Lusavoritch*, Gr. *Phōtistēs*), was of the royal Parthian race of the Arsacidæ, and son of Anak, murderer of Chosrov I., king of Armenia. For this crime his whole family was slain save himself. He owed his escape to a Christian nurse, who secretly conveyed him, when he was two years old, to Cæsarea, in Cappadocia, her native town. He there married a Christian, who bore him two sons, and soon afterwards became a nun. Gregory proceeded to Rome, and entered the service of Terdat, Chosrov's son. After Terdat (Tiridates III.) had, with the help of the Romans, recovered his father's kingdom (286), Gregory, for his refusal to crown with garlands the statue of Anahit, tutelary goddess of Armenia, was thrown by Terdat into a deep pit, where a pious widow nourished him for fourteen years. About the end of that time Terdat was visited with the punishment of Nebuchadnezzar. Healed and baptised by Gregory, he became a zealous Christian, and established Christianity by force throughout his dominions. Gregory was consecrated bishop and head of the Armenian Church by Leontius, Archbishop of Cæsarea, and erected a great number of churches, monasteries, hospitals, and schools in which the sons of heathen priests were trained for the Christian priesthood, whereby a strongly national stamp was given to the church in Armenia. Having resigned the patriarchate in favour of his second son Aristaces, Gregory in 331 retired to a cave at the foot of Mount Sebuh in Upper Armenia, where he died in a few years. The patriarchate was held for many years by his descendants.

The sources for the history of Gregory, which is partly legendary, are two early Armenian histories written by Agathangelos and by Simeon Metaphrastes. A French translation of the former by Victor Langlois appears in vol. i. of the *Historiens de l'Arménie* (1867); the latter (evidently drawn from the former) is given in vol. cxv. of Migne's *Patrol. Græc.* The former was known to

Moses of Khorene, the Herodotus of Armenia, who flourished in the 5th century. The best edition of his work was printed at Venice in 1865; a Latin translation by the brothers Whiston appeared at London in 1736; a French by Levaillant de Florival at Paris in 1841. See S. C. Malan's Eng. translation (1868) of the life of Gregory, from the Armenian work of the Vartabed Matthew published at Venice, 1749.

Gregory Nazianzen was, by his own account, born about 330, at Arianzus, a village near Nazianzus, in Cappadocia, not far from Cæsarea. His father, whose name also was Gregory, and who had originally belonged to the heathen sect of Hypsistarians, worshippers of the Most High, but also of the fire, like the Persians, and keepers of the Jewish Sabbath and the law of the purity of meats, had, chiefly through the influence of his pious wife Nonna, become a convert to Christianity about the time of the great Nicene Council (325), and four years later was raised to the dignity of Bishop of Nazianzus. Formed to piety by domestic example, Gregory was at an early age sent to Cæsarea in Palestine, where the study of eloquence then flourished. He next attended the schools of Alexandria, and subsequently (about 348 to 358) of Athens, where he met Basil the Great, then also a young student, and became his most intimate friend. At the same time there studied at Athens Julian, later emperor and apostate, and there is no doubt that the three often met and had friendly discussions on the subjects of their common studies; although Gregory, even at that time, augured no good for Julian, who exhibited signs of 'an unsettled and arrogant mind.' Gregory, having made brilliant progress in eloquence, philosophy, and sacred literature, returned to Nazianzus, and in 360 received baptism at the hands of his own father, consecrating to God, at the same time, all 'his goods, his glory, his health, his tongue, and his talents;' and, in order to be still more able to pursue a life of austere devotion, he took up his abode with Basil in the desert near the river Iris, in Pontus. Recalled by his father, Gregory was ordained priest, but afterwards fled. Being recalled a second time, he returned to Nazianzus, assisted his father in the ministry, and preached to the people. In 371 or 372 St Basil, who in the meantime had become Bishop of Cæsarea, prevailed upon him to accept the see of Sasima, a small town in Cappadocia. But he had scarcely taken possession of his new dignity, when, overcome again by his innate repugnance to public life, he retired, a bishop without a bishopric, to Nazianzus, where he stayed until the death of his father in 374. He then went into a monastery at Seleucia, which, however, after the death of the Emperor Valens (378), he was induced to leave, in order to undertake the charge of a small Nicene congregation in Constantinople, where until then Arianism had held undisputed sway. Gregory was after a short time, when his erudition and eloquence became conspicuous, elected archbishop, upon which the Arians became so exasperated that his very life was in danger. Gregory, although upheld by Pope Damasus and the Emperor Theodosius, preferred resigning his see voluntarily, 'in order to lay the storm, like another Jonah, although he had not excited it.' He went back to Nazianzus, and took up his solitary abode near Arianzus, where, after some years of a most ascetic life, he died in 389. His ashes were conveyed to Constantinople, and thence, during the Crusades, to Rome. His day is, with the Latins, the 9th of May. His character and temper, ardent and enthusiastic, but at the same time dreamy and melancholy, hard, but also tender, ambitious and yet humble, and all his instability and vacillation between a life of contemplation and of action, are vividly depicted in his writings. These mostly serve the great aim of his life—to uphold the integrity of Nicene orthodoxy against the heresies of the Arians and Apollinarists. The merits of his writings are very unequal, sometimes rising to sublime flights of poetical genius, and displaying classical elegance and refinement, at other times redundant, pedantic, and heavy with far-fetched similes. Yet Gregory may fairly be pronounced one of the first orators and most accomplished and thoughtful writers of all times. His surviving works consist chiefly of about 45 sermons, 243 letters, and 407 poems (dogmatic and moral poems, prayers and hymns, autobiographic and historical poems, epitaphs, and epigrams). The poems were separately printed in a beautiful Aldine edition at Venice in 1504. The first edition of his complete works appeared at Basel in 1550, folio. All the earlier editions were set aside by the great and long-delayed edition that appeared under the auspices of the Benedictines, in 2 vols. (Paris, 1778-1842). The first volume was finally edited by Clemencet; the second by Caillou. His separate works have frequently been edited, and partly translated into different tongues.

See monographs by Ullmann (1825; Eng. trans. 1851; 2d ed. Gotha, 1867) and by A. Benoit (Paris, 1876); and Montant's *Récits critiques* (1878).

Gregory of Nyssa, the younger brother of Basil the Great. After being educated by Basil, he showed an inclination to become a teacher of eloquence, but by the influence of Gregory Nazianzen was prevailed upon to devote himself to the church. Though married, he was in 371 or 372 consecrated by Basil bishop of the little town of Nyssa, in Cappadocia. During the persecution of the adherents of the Nicene Creed in the reign of Valens, Gregory was, at the instigation of the governor of Pontus, deposed by a synod held in Galatia, on the pretext that he had wasted the church's goods. He made his escape, and after the death of Valens was joyfully welcomed back by his flock (378). He was present at the Council of Constantinople in 381, and (along with two other bishops) was appointed to the general oversight of the diocese of Pontus both by the council and by a decree of his friend Theodosius, by whom he had been called 'the common pillar of the church.' He travelled to Arabia and Jerusalem to set in order the churches there, and was again at a synod in Constantinople in 394. He must have died soon afterwards. Of the three Cappadocians Gregory was the greatest speculative theologian, the most faithful to Origenistic views, and not the least zealous defender of Nicene doctrine. He was a less able ruler than Basil, who sometimes lamented his untimely 'good nature' and 'simplicity.' His chief dogmatic work is his *Twelve Books against Eunomius* (the so called 13th book is an independent work). Among his other works are treatises on the doctrine of the Trinity, including *Antirrheticus* (against Apollinaris) and an appeal *To the Greeks, from 'common notions'* (axioms), an attempt to establish the doctrine on grounds of abstract reason; a treatise *On Destiny* (against pagan fatalism); *On the Soul and Resurrection* (ed. Krabinger, Leip. 1837), in the form of a dialogue with his sister Makrina on her deathbed; several ascetic treatises, many sermons, and 23 epistles. In his great *Catechetical Discourse* (ed. Krabinger, Munich, 1838), which was written to convince educated heathens and Jews, he argues that the incarnation is the best possible form of redemption, as manifesting the four chief attributes of God—his omnipotence, mercy, wisdom, and justice. God alone *is*, and all turning away from God to the things of sense (things without being) is death. Christ did not assume a single human nature, but human nature itself in its entirety. 'His return from death is for the mortal race the

beginning of their return to eternal life.' His incarnation is of cosmical significance, and extends to the whole spiritual creation, bringing the whole universe into harmony. 'Not only among men is he born man, but (with absolute consistency) coming also into being among angels he brings himself down to *their* nature' (*Discourse on the Ascension of Christ*). 'By this,' says Harnack, 'the incarnation is resolved into a necessary cosmical process; it becomes a special case of the omnipresence of the Deity in his creation. Alienation from God is as much included in the plan of the Kosmos as is restitution to him. Gregory helped to hand on to later times the pantheistic thought which he never himself conceived clearly and apart from the historical. There is a real kinship between him and the pantheistic Monophysites, the Areopagite, Scotus Erigena, and even the modern "liberal" theologians of Hegelian dye.'

His works were edited by Fronton du Duc (Paris, 1615; reprinted 1638), and more completely in Migne's *Patrologia* (series Græca, vols. xliv. xlvi.). A beginning was made towards a good critical edition by G. H. Forbes (Burntisland, 1855) and Fr. Oehler (Halle, 1865). The latter has published a selection with a German translation (4 vols. Leip. 1858–59). See J. Rupp's monograph on Gregory (1834); H. Weiss, *Die drei grossen Cappadocier* (1872); and Harnack, *Dogmengeschichte*, vol. ii. (1888).

Gregory of Tours, the 'father of Frankish history,' was born about 540 at Arverna (now Clermont), the chief town of Auvergne, and belonged to one of the most distinguished Roman families of Gaul. Originally called Georgius Florentius, he assumed the name Gregory out of respect for his mother's grandfather, Gregory, Bishop of Langres. He was educated by his uncle, Gallus, Bishop of Clermont, and after his death by Avitus, a priest of his native town. His recovery from a severe sickness, through a pilgrimage to the grave of St Martin of Tours, led Gregory to devote himself to the service of the church, and by the choice of the clergy and people and favour of Sigbert, king of Austrasia, to whom Auvergne had fallen on the death of Clothar I. in 561, he became Bishop of Tours in 573. He gave himself zealously to his sacred office and the public good. In the struggles between Sigbert and his wife Brunhilda on the one side against Chilperic and his wife Fredegond on the other he took the side of the former, and in the vicissitudes of a conflict in which Tours frequently changed masters had to suffer many persecutions. After the death of Chilperic, whom Gregory calls 'the Nero and Herod of our time,' he enjoyed great influence over his successors, Guntram and Childebert II. He died 17th November 594. The fame of Gregory rests on his *Historiæ sive Annalium Francorum libri x.*, the chief authority for the history of Gaul in the 6th century. It begins with a summary of universal history, but by the end of book i. reaches the Frankish conquest and the death of St Martin. From this point onwards the narrative is written with much greater fullness, the last seven years (585–91) extending to four books. Gregory himself laments his unskilfulness in writing—his wrong genders and cases, and misused prepositions. His ten books are the artless memoranda of a contemporary, bearing on their face the clear stamp of truth. It is entirely to him that we owe our exact knowledge of the dark and stormy times of the Merovingian kings.

Besides his *History*, he wrote *Miraculorum libri vii.*, a hagiographical compilation, including four books on the innumerable miracles of St Martin. A critical edition of his works was published by Ruinart in 1699 (1 vol. folio), and in Migne's collection (vol. lxxi.). Of the History the best editions are by Guadet and Taranne (1836–38), and that in the *Monumenta Germaniæ Historica* (1884–85). French translations are by H. L. Bordier (2 vols. 1859–61) and that edited by Jacobs (2 vols. 1861); there is a German translation by W. Giesebrecht (1851; 9th ed. 1873). The historical material supplied by Gregory is reproduced in Thierry's *Récit des Temps Mérovingiens* (Paris, 1840). A French translation of the *Books of Miracles* and lesser writings was published by H. L. Bordier (4 vols. 1857–64). See Lobell, *Gregor von Tours und seine Zeit* (1839; 2d ed. 1869); G. Monod, *Études critiques sur les sources de l'Histoire Mérovingienne* (Paris, 1872); and vol. i. of Mark Pattison's *Essays* (1889).

Gregory Thaumaturgus ('wonder-worker'), a celebrated disciple of Origen, and the apostle of the Christian church in Pontus. He was born about 210, of wealthy heathen parents at Neocæsarea, in Pontus, and was originally named Theodorus. His early education was for the practice of law, but, coming under the influence of Origen at Cæsarea in Palestine, he was his disciple for about eight years, with an interruption caused by the persecution under Maximin the Thracian, during which he probably studied at Alexandria. Origen, in a letter to him, expressed the wish that he would 'spoil the Egyptians' by placing the intellectual treasures he gathered from the Greeks in the holy service of Christian philosophy. After this he produced his *Panegyricus* on Origen, and, returning to his native country, was consecrated Bishop of Neocæsarea by Phædimus, Bishop of Amasea. The influence of Gregory in Asia Minor continued from the middle of the 3d century to far down into the 4th, and its extent may be inferred from the numerous legends of his miracles, and the tradition that at his death (about 270) there were only as many pagans in Neocæsarea as there had been Christians in it at his consecration—viz. seventeen. His celebrated *Ekthesis*, or *Confession of Faith*, said to have been derived by revelation from the Virgin Mary and the apostle John, is a summary of the theology of Origen, and was used as the basis of the instruction given to catechumens at Neocæsarea. It is of the greatest value as a record of the state of the theology at the middle of the 3d century. 'There is scarcely a sentence in it,' says Harnack, 'that recalls to us the Bible; it is a compendium of the sublimest speculation, only in the words "Father," "Son," and "Spirit" reminding us of the gospel.' Its genuineness is disputed, but is ably defended by Caspari. Gregory is said to have contended against Sabellianism, yet in his lost *Argument with Elian* Basil tells us there stood this sentence: 'the Father and the Son are two in idea, but one in essence.' But as Basil also testifies that he spoke of the Son as a 'creature' and a 'work,' the above sentence is probably no more than an Origenistic assertion of the substantial unity of the Deity in opposition to tritheistic views. The genuineness of two other treatises attributed to him, one addressed to Philagrius, on the co-essentiality of the persons in the Godhead, and the other, a dialogue with Theopompus, on the question whether the Deity is capable or incapable of suffering, is undecided. Gregory's works are printed in vol. iii. of Galland's *Bibliotheca Patrum*, and in Migne's collection, vol. x. His *Panegyricus* (which contains an autobiography of its writer) is printed among the works of Origen. A special edition was published by J. A. Bengel in 1722.

See Ryssel, *Gregorius Thaumaturgus, sein Leben und seine Schriften* (Leip. 1880); and Harnack, *Dogmengeschichte*, vol. i. (Freiburg im Breisgau, 1888).

Gregory, the name of a Scottish family distinguished, like that of the Bernouillis, in the history of science.—JAMES GREGORY was born at Aberdeen in November 1638, and studied at Marischal College there. Before completing his twenty-fourth year he invented the reflecting telescope known by his name, and described it in a work entitled *Optica Promota*. In 1665 he

were to the university of Padua, where in 1667 he produced *Vera Circuli et Hyperbolæ Quadratura*, followed in 1668 by *Geometriæ Pars Universalis* and *Exercitationes Geometricæ*. Shortly after his return home he obtained (1669) the professorship of Mathematics at St Andrews, a chair which he filled until his removal to a similar one at Edinburgh in 1674. He died in that city in the following year. To him is also attributed a satirical tract, *Great and New Art of weighing Vanity* (1672). For an account of his works and discoveries, see Hutton's *Philosophical and Mathematical Dictionary*.—DAVID GREGORY, nephew of the above, was born at Aberdeen in 1661, and there received the early part of his education, which was completed at Edinburgh. In his twenty-third year he was appointed professor of Mathematics in the university of the latter city. In 1691, through the friendship of Newton and Flamsteed, he obtained the Savilian professorship of Astronomy at Oxford. He died at Maidenhead in 1708. Among his works may be mentioned *Exercitatio Geometrica de Dimensione Figurarum* (1684); *Catoptrica et Dioptrica Sphærica Elementa* (1695); *Astronomiæ Physicæ et Geometricæ Elementa* (1702), an illustration and defence of Newton's system; and an edition of Euclid in Greek and Latin (1703). He also wrote a treatise on *Practical Geometry* (1745) and many memoirs in the *Phil. Trans.*, vols. xviii.–xxv.—JOHN GREGORY, grandson of James, was born at Aberdeen, 3d June 1724, where he received his early education; afterwards he studied medicine at Edinburgh and Leyden. After filling the chair of Medicine at Aberdeen from 1755, he was appointed in 1766 professor of the Practice of Medicine in Edinburgh, where he died, 9th February 1773. Among his works are *Elements of the Practice of Physic* (1772) and *A Comparative View of the State and Faculties of Man with those of the Animal World* (1765). In 1788 his works were collected in four vols. by Tytler (Lord Woodhouselee), who prefaced them by a life of the author.—His son, JAMES GREGORY, born at Aberdeen in 1753, became in 1776 professor of the Practice of Medicine at Edinburgh, and eventually a leading man in his profession. He died 2d April 1821. He was the author of *Conspectus Medicinæ Theoreticæ* and of two vols. of *Philosophical and Literary Essays* (1792).—This James's son, WILLIAM GREGORY, born 25th December 1803, professor of Chemistry at Glasgow (1837), in King's College, Aberdeen (1839), and at Edinburgh University (1844), is noticeable for his advocacy of Liebig's views in Great Britain. He died 24th April 1858. He wrote *Outlines of Chemistry* (1845), and translated (1855) Liebig's *Principles of Agricultural Chemistry*.—The stomachic and aperient known as Gregory's mixture was compounded by Dr James Gregory, and consists of rhubarb, magnesia, and ginger.

Gregory, OLINTHUS, mathematician and miscellaneous writer, was born at Yaxley, Huntingdon, 29th January 1774, and became a newspaper editor and then a teacher of mathematics successively at Cambridge and Woolwich. At Woolwich he died 2d February 1841. He wrote several works on mathematics, superintended almanacs, edited gentlemen's diaries, and published lives of Robert Hall and Mason Good.

Greifenberg, a town of Prussia, in the province of Pomerania, dating from 1262, is situated 55 miles by rail NE. of Stettin. Pop. 5636.

Greifenhagen, an agricultural town of Prussia, on the Oder, 13 miles by rail SSW. of Stettin. Pop. 6603.

Greifswald, a town of Prussia, in the province of Pomerania, is situated 2½ miles from the mouth of the Ryck and 25 miles by rail SE. of Stralsund. The university, founded in 1456, has 83 professors and 750 students, of whom one-half are medicals. The university is well equipped with medical museums, laboratories, &c.; the library contains about 135,000 volumes. There is a considerable shipping trade. The chief industries include the making of machinery, chains, and railway wagons, the curing of herrings, and iron-founding. Pop. (1875) 18,016; (1885) 20,333. Shortly after being made a town (1250) Greifswald joined the Hanseatic League. At the peace of Westphalia (1648) it came into the possession of Sweden; but, together with the whole of Swedish Pomerania, was ceded to Prussia in 1815. See Pyl's *Geschichte Greifswalds* (1879).

Greisen, a rock composed essentially of quartz and mica, but which almost invariably contains topaz. It is met with in regions where tin ores abound, and is believed to be a granite which has been metamorphosed in connection with exhalations of fluoric acid.

Greiz, capital of the German principality of Reuss-Greiz, and seat of the sovereign prince, is situated on the White Elster, 47 miles SSW. of Leipzig. It contains three castles and a 13th-century church, and manufactures cotton and woollen goods, also cashmere and shawls, and possesses dye-works and linen-printing establishments. Pop. (1875) 12,657; (1890) 20,141. The town was severely ravaged by fire in 1494, and again in 1802.

Grenada, an island of volcanic origin in the British West Indies, lying N. by W. from Trinidad, mountainous and picturesque, with an area of 133 sq. m. Some of the craters in the central ridge of mountains, rising to 3000 feet, have been transformed into large lakes. Streams and mineral springs abound. There are several good natural harbours, that of St George (pop. 4000), the capital of the island and the headquarters of the government of the Windward Islands, being accounted one of the best in the West Indies, though it is not now much used. The inhabitants, 42,403 in 1881, and 54,062 in 1891 (mostly negroes, with 2118 coolies), cultivate cocoa, coffee, and oranges. Further, a little rum is manufactured, and spices and fruits are grown. Exports, £280,000 a year; imports, £170,000. Grenada has been a crown colony since 1885; previous to that date it had a constitutional government. Columbus was the discoverer of the island in 1498. In the words of Mr Froude, Grenada was 'the home for centuries of man-eating Caribs, French for a century and a half, and finally, after many desperate struggles for it, was ceded to England at the treaty of Versailles' (1783).

Grenade, a small shell exploded by a time-fuse, about 3 inches in diameter, of iron or annealed glass, filled with powder, and thrown from the hand. They are chiefly used against the dense masses of troops assembled in the ditch of a fortress during an assault, and then are often rolled over the parapet through wooden troughs instead of being thrown by hand.

Grenadier, originally a soldier who was employed in throwing hand-grenades, and then a member of the first company of every battalion of foot, in which the tallest and finest men were placed. This company used to be distinguished by tall bearskin caps, and held the place of honour—viz. the right when in line, and the front when in column. In the British army the name is now only used as the title of the first three battalions of the foot-guards.

Grenadines, a chain of islets in the West Indies, extending between Grenada, on which they

are chiefly dependent, and St Vincent, with a total area of 13 sq. m., and about 7300 inhabitants. The largest is Carriacou, with nearly 11 sq. m.; pop. 6000.

Grenelle, a south-western suburb of Paris.

Grenoble (Lat. *Gratianopolis*), since 1839 a first-class fortified city of France, capital of the department of Isère, is finely situated in a beautiful valley 59 miles SE. of Lyons. It is divided by the Isère into two unequal portions, connected by three bridges. The 15th-century cathedral of Nôtre Dame, St Laurent, St André (with Bayard's monument, transferred hither in 1822), and the Gothic *palais-de-justice* are the most interesting buildings. The town has a university of three faculties, with about 275 students, and numerous other educational establishments, including an industrial school and a school of forestry. The library contains 170,000 volumes and 7500 MSS. The staple industry is the manufacture of kid gloves (employing 22,000 persons in 115 factories). Besides this, there are manufactures of liqueurs (Chartreuse), hats, cement, and hardware, and an active trade in hemp, corn, timber, wine, and cheese. Pop. (1872) 35,280; (1886) 49,338. Grenoble, originally a city of the Allobroges, was fortified by the Romans. It was Burgundian in the 5th century, and in the 11th belonged to the empire. Later on it became the capital of Dauphiné, along with which it passed to France in 1349. The town has been frequently inundated, the flood of 1778 being the most memorable. See Pitot's *Histoire de Grenoble* (2 vols. 1845-46).

Grenville, GEORGE, the English statesman who passed the Stamp Act which first drove the American colonies to resistance, was born on 14th October 1712. He was younger brother to Richard Grenville, Earl Temple (q.v.), and brother-in-law of the Earl of Chatham. He entered parliament in 1741, and from 1744 to 1762 filled several government offices. In 1757 he introduced a bill for the regulation of the payment of the navy. In 1762 he became Secretary of State, and then First Lord of the Admiralty; and in the following year he succeeded Lord Bute as prime-minister, uniting in himself the offices of Chancellor of the Exchequer and First Lord of the Treasury. The most prominent facts of his administration were the prosecution of Wilkes and the passing of the American Stamp Act. He resigned the premiership in 1765, and died 13th November 1770. Although an honest and honourable man, his overleaping ambition, want of tact, and imperious nature made him a highly unpopular minister. See the *Grenville Papers*, edited by W. J. Smith (4 vols. 1852-53).

Grenville, SIR RICHARD, one of England's unforgotten worthies, sprang from an ancient Cornish family, and early distinguished himself under Elizabeth by his courage both on land and sea. He was knighted about 1577, and in 1585 commanded the seven ships which carried out Raleigh's first colony to Virginia, the ill-success of which, according to Ralph Lane, its leader, was mainly due to the commander's tyranny. Linschoten speaks of the fierceness of his temper, and how at table he would crush the glasses between his teeth till the blood ran out of his mouth. Grenville fought and spoiled the Spaniards like other heroes of his time, and while preparing another fleet for Virginia was stayed by the queen at Bideford to take his share in the glory of the Armada fight. In August 1591 he commanded the *Revenge* in Lord Thomas Howard's squadron of six vessels, when they fell in with a Spanish fleet of fifty-three sail off Flores, in the Azores. Grenville took off his ninety sick men from the island, and, while the admiral made good his escape, refused with splendid disobedience 'to turn from the enemy, alleging that he would rather choose to die than to dishonour himself, his country, and her majesty's ship.' The great *San Philip*, of 1500 tons, towering in height above the *Revenge*, soon took the wind from her, and now she found herself in the midst of a ring of enemies, and a battle almost unequalled in the history of the world began. From three in the afternoon, and all through the night till morning the battle raged, the stars above blotted out by the sulphurous canopy of smoke, while as many as fifteen several Spanish ships were beaten off in turns, and no less than 800 shot of great artillery endured. Two ships were sunk by her side, two more so disabled that they soon foundered, while as many as 2000 men were slain or drowned. But the *Revenge* was by this time a helpless wreck, all her powder spent, the pikes broken, forty of her 100 sound men slain, and the most part of the rest hurt, the vice-admiral himself sore wounded, both in the body and in the head. Sir Richard would have had the master-gunner to blow up the ship, but was overborne by his surviving men, and carried on board one of the Spanish ships, where he died of his wounds the second or third day after, with the words on his lips, according to Linschoten's account: 'Here die I, Richard Grenville, with a joyful and quiet mind: for that I have ended my life as a true soldier ought to do, that hath fought for his country, queen, religion, and honour. Whereby my soul most joyfully departeth out of this body, and shall always leave behind it an everlasting fame of a valiant and true soldier, that hath done his duty as he was bound to do.' 'What became of his body,' says Raleigh, 'whether it were buried in the sea or on the land we know not: the comfort that remaineth to his friends is, that he hath ended his life honourably in respect of the reputation won to his nation and country, and of the fame to his posterity; and that, being dead, he hath not outlived his own honour.' A few days after the fight a great storm arose from the west and north-west, in which fourteen Spanish ships, together with the *Revenge* and in her 200 Spaniards, were cast away upon the Isle of St Michaels, besides fifteen or sixteen more upon the other islands. 'So it pleased them to honour the burial of that renowned ship the *Revenge*, not suffering her to perish alone, for the great honour she achieved in her lifetime.' 'Hardly,' says Froude, 'as it seems to us, if the most glorious actions which are set like jewels in the history of mankind are weighed one against the other in the balance, hardly will those 300 Spartans who in the summer morning sat combing their long hair for death in the passes of Thermopylæ have earned a more lofty estimate for themselves than this one crew of modern Englishmen.'

This great exploit was told in noble English by Sir Walter Raleigh in *A Report of the Truth of the Fight about the Iles of Açores, this last Summer* (1591); in good verse by Gervase Markham, in *The Most Honorable Tragedie of Sir Richard Grinuile, Knight* (1595); by Jan Huygen van Linschoten, in his diary (Dutch, 1596; Eng. 1598), the three reprinted together by Arber (1871); by Froude, in 'England's Forgotten Worthies,' in the *Westminster Review* for July 1852, since included in the first volume of his *Short Studies on Great Subjects*; and by Tennyson in *The Revenge*, the noblest heroic ballad in the English tongue—set not unworthily to music in Villiers Stanford's cantata produced at Leeds in 1886.

Sir Richard Grenville was grandfather of the English Bayard, Sir Bevill Grenville (born 1596), the hero of Hawker's spirited ballad, who was killed at the battle of Lansdown, near Bath, 5th July 1643.

Grenville, WILLIAM WYNDHAM, LORD GRENVILLE, third son of George Grenville, was born 25th October 1759. After studying at Eton and Oxford,

he became in 1782 a member of the House of Commons and secretary to his eldest brother, Earl Temple (afterwards Marquis of Buckingham), just appointed Lord-lieutenant of Ireland. Soon after he became Paymaster-general of the Army, and in 1789 was chosen Speaker of the House of Commons. But in 1790, on his appointment as Secretary of State for the Home Department, he was raised to the peerage with the title of Baron Grenville. He became Foreign Secretary in the ensuing year. He resigned office, along with Pitt, in 1801, on the refusal of George III. to give his assent to the Catholic Emancipation Bill, of the aims of which Grenville was one of the principal supporters. In 1806 he formed the government of 'All the Talents,' which, before its dissolution in the following year, passed the act for the abolition of the slave-trade. From 1809 to 1815 he acted along with Earl Grey, and he generally supported Canning. Lord Grenville was an able speaker and an excellent scholar, and, though he was not of first-rate abilities, his conscientiousness, industry, and knowledge of affairs gave him much influence among the peers and as a statesman. He died at Dropmore, Buckinghamshire, 12th January 1834.

Grenville-Murray. See MURRAY.

Gresham, SIR THOMAS, founder of the Royal Exchange, was born in 1519, the only son of Sir Richard Gresham, an opulent merchant of Norfolk ancestry, who in 1537 was elected Lord Mayor of London. Apprenticed awhile to his uncle, Sir John Gresham, a wealthy London mercer, and then sent to study at Gonville Hall, Cambridge, in 1543 he was admitted a member of the Mercers' Company, and in 1551 was employed as 'king's merchant' at Antwerp. In two years he paid off a heavy loan, entirely restored the king's credit, and introduced a new system of finance. As a Protestant, he got his dismissal from Queen Mary, but, on presenting a memorial of his past services, was soon reinstated. By Queen Elizabeth he was in 1559 knighted and appointed for a short time English ambassador at the court of the regent at Brussels. The troubles in the Netherlands compelled him, in 1567, to withdraw finally from Antwerp, to which city he had made more than forty journeys on state service; in one, in 1560, he was thrown from his horse and lamed for life. In 1569, by his advice, the state was induced to borrow money from London merchants, instead of from foreigners, to the great advantage of the mercantile body. Having in 1564 lost his only son, Richard, in 1566–71 he devoted a portion of his great wealth to the erection of an Exchange (q.v.), in imitation of that of Antwerp, for the London merchants, who were wont to meet in the open air. Renowned for his hospitality and liberality, he frequently entertained foreign personages of distinction, and erected a magnificent mansion at Osterly Park, near Brentford, where he was visited by Queen Elizabeth. For the endowment of a college in London he directed by his will that his town-mansion in Bishopsgate Street should be converted into a residence and lecture-rooms for seven professors, to be salaried out of the Royal Exchange revenues. Gresham College gave place to the Excise Office in 1768, and the lectures were delivered in a room in the Exchange till 1843, when the lecture-hall in Basinghall Street was built out of the accumulated fund. The subjects of lectures (all of which since 1876 are delivered in English only, not Latin) are divinity, physic, astronomy, geometry, law, rhetoric and music. Gresham also provided for the erection and support of eight almshouses, and made many other charitable bequests. He died suddenly, 21st November 1579. See his Life by Dean Burgon (2 vols. 1839). For Gresham's Law, see BIMETALLISM.

Gretna Green, a village of Dumfriesshire, near the head of the Solway Firth, 10 miles NNW. of Carlisle. After the abolition of Fleet marriages by Lord Hardwicke's Act (1754), English persons wishing to marry clandestinely had to get out of England, to which alone that act had reference. Thus the practice arose of crossing the Border into Scotland, where Gretna Green, or Springfield, as the first village, had by 1771 become, in Pennant's words, 'the resort of all amorous couples whose union the prudence of parents or guardians prohibits.' The 'priest' or 'blacksmith' might be any one—ferryman, toll-keeper, or landlord; his fee might be anything from half a guinea to £100; and 'church' was commonly the toll house till 1826, and afterwards Gretna Hall. At the toll-house nearly 200 couples were sometimes united in a twelvemonth. Coldstream and Lamberton, in Berwickshire, were chapels-of-ease to Gretna for the eastern Border, as also till 1826 was Portpatrick, in Wigtownshire, for Ireland. One of the earliest Scottish runaway matches on record is Richard Lovell Edgeworth's (1763); amongst his successors were Lords Brougham, Dundonald, Eldon, and Erskine, besides numerous scions of the noble families of Villiers, Fane, Beauclerc, Coventry, Paget, &c. In 1856 all irregular marriages were rendered invalid unless one of the parties had been residing in Scotland for three weeks previously; this proviso observed, a Gretna Green marriage is still possible. See P. O. Hutchinson's *Chronicles of Gretna Green* (2 vols. 1844).

Grétry, ANDRÉ ERNEST MODESTE, composer, was born at Liège, 8th February 1741, studied at Rome, and settled at Paris, where he became famous as author of more than forty comic operas, of which *Le Huron* (1768) and *Lucile* (1769) were the earliest, and *Raoul* and *Richard Cœur-de-Lion* among the best known. He was made inspector of the Conservatoire, and a member of the Institute; later a pension from Napoleon enabled him to retire to Ermenonville, where, in Rousseau's old house, he died, 24th September 1813. His operas are noted for their rich and bright melody, and did much to form the musical taste of the time. He also wrote *Mémoires* (4 vols. Paris, 1796). See the Lives by Gregoir (1883) and Brenet (1884).

Greuze, JEAN BAPTISTE, genre- and portrait-painter, was born at Tournus, near Macon, on 21st August 1725. He received instruction in art from Grandon, a painter of Lyons, who took him to Paris, where he studied in the life-school of the Academy, and produced a subject-picture of such excellence—'A Father explaining the Bible to his Children'—that much doubt was expressed as to its being the work of so young an artist. His skill, however, was amply proved by productions which followed, and his 'Blind Man Cheated' procured his admission as an Associate of the Academy in 1755. In that year he visited Italy with the Abbé Gougenot, and on his return exhibited in 1757 several Italian subjects, but having failed to comply with the regulations of the Academy he was interdicted from contributing to the salon. Having painted in 1769 his 'Severus reproaching Caracalla,' now in the Louvre, he was readmitted as a genre-painter, instead of to the higher class of historical painters, and upon this he indignantly withdrew. He was the friend of Diderot, who praised his productions in his criticisms of the salon; but in the days of the Directorate and the classical revival of David his works were little esteemed; and he died in poverty in Paris, 21st March 1805. His art possesses charming qualities of delicacy and grace, but is marred by its triviality, by the insincerity of its sentiment, and by its pursuit of mere prettiness. He is seen at his best

in his domestic interiors with figures, and especially in such fancy studies of girls as 'The Broken Pitcher' in the Louvre, the 'Innocence' and 'Girl with Doves' in Sir Richard Wallace's collection, and 'Girl with Dead Canary' in Scottish National Gallery. See monograph by Normand (1892).

Greville, Charles Cavendish Fulke, writer of memoirs of his time, the eldest son of Charles Greville by his wife, Lady Charlotte Cavendish Bentinck, was born in 1794. He was educated at Eton and at Christ Church, Oxford. Before he was twenty he was appointed private secretary to Earl Bathurst. In 1821 he became Clerk of the Council in Ordinary, an office which he discharged until 1860. During the last twenty years of his life he occupied a suite of rooms in the house of Earl Granville, in Bruton Street, and there he died, 18th January 1865. In advocacy of the completion of the measure of relief to the Catholics by the payment of their clergy he wrote *Past and Present Policy of England towards Ireland* (1845). His position as Clerk of the Privy-council brought him into intimate relations with the leaders of both political parties, and gave him peculiar facilities for studying court life from within—advantages which the shrewd intelligence and cultured versatility of Greville turned to the best account by penning miscellaneous memoirs dealing alike with public and private affairs, and containing many lively, immediate sketches of the distinguished personages of his time, political, social, and literary. The first part of the *Memoirs*, covering the reigns of George IV. and William IV., edited by Mr Reeve, appeared in 1875. The second part, embracing the period 1837–51, was published in 1885; and the third, 1852–60, in 1887.

Greville, Sir Fulke, poet and friend of much greater poets than himself, was born of a good Warwickshire family in 1554. He studied at Cambridge, travelled abroad, made a figure at court, was knighted in 1597, and created Lord Brooke in 1620. He was murdered in an altercation with his serving-man, 30th September 1628. Several didactic poems, more than a hundred sonnets, and two tragedies were printed in 1633; his Life of Sir Philip Sidney in 1652. Grosart edited his works (4 vols. 1870), and published a selection (*The Friend of Sir Philip Sidney*) in 1895.

Gréville, Henry, the pseudonym of Madame Alice Durand (*née* Fleury), who was born at Paris, 12th October 1842, accompanied her father when he was called to a chair at St Petersburg in 1857, and there married Émile Durand, a French professor of law, with whom she returned to France in 1872. Already at St Petersburg she had contributed romances to the journals; when at Paris she began to issue with almost too great rapidity a series of novels, often bright, vigorous, and original in their pictures of Russian society, but unequal, occasionally feeble, and sometimes even not free from the one fatal fault of dullness. *Dosia* (1876) received from the Academy the Montyon prize, and was followed by *La Princesse Ogheroff* (1876), *Les Koumiassine* (1877), *Suzanne Normis* (1877), *La Maison Maurice* (1877), *Les Epreuves de Raissa* (1877), *L'Amie* (1878), *Un Violon Russe* (1879), *Lucie Rodic* (1879), *Le Moulin Frappier* (1880), *La Cote Monard* (1880), *Perdue* (1881), *Madame de Dreux* (1881), *Rose Rozier* (1882), *Un Crime* (1884), *Louis Breuil* (1883), *Idylles* (1885), and *Cléopâtre* (1886).

Grévy, François Paul Jules, President of the French Republic, was born at Mont-sous-Vaudrey, in the Jura, August 15, 1807. He studied law in Paris, and was admitted an advocate, acquiring distinction as the defender of republican political prisoners. After the Revolution of 1848 he was commissary of the provisional government in his native department, for which also he was returned to the Constituent Assembly. While preserving an independent attitude, he usually voted with the Left, and his ability as a speaker soon brought him into prominence. He became Vice-president of the Assembly, and took a leading part in the constitutional debates. He opposed the government of Louis Napoleon, and condemned the expedition to Rome. After the *coup d'état* he retired from politics and confined himself to the bar, but in 1869 he was again returned as deputy for the Jura. He denounced the Second Empire during its closing days, and in February 1871 was elected President of the National Assembly, being re-elected in 1876, 1877, and 1879. The Monarchists were triumphant from 1873 to 1876, but their schemes were trenchantly attacked by Grévy, who likewise published a pamphlet entitled *The Necessary Government*. Upon the resignation of Marshal MacMahon in 1879 Grévy was elected President of the Republic for seven years, securing 563 votes out of a total of 713. Although his presidency was not brilliant, it was frequently marked by much tact, as on the occasion of the hostile demonstration against the king of Spain, on his visit to Paris in 1883. The republic was consolidated and strengthened at home, but the foreign policy of France was inglorious, and in March 1885 President Grévy closed the Tonkin difficulty by concluding peace with China upon his own initiative. In December 1885 Grévy was elected president for a further period of seven years, but, hampered by ministerial difficulties, resigned in December 1887. He died at Mont-sous-Vaudrey, 9th September 1891.

Grewia, a genus of Tiliaceous trees yielding good bast for ropemaking, &c. in the East Indies. Some yield timber, and others their leaves as fodder.

Grey, Charles, Earl, statesman, was born at Falloden, Northumberland, 15th March 1764, and educated at Eton and Cambridge. On attaining his majority he was returned to parliament as member for Northumberland in the Whig interest, and ultimately succeeded to the leadership of the party. He was one of the managers of the impeachment of Warren Hastings, and in 1792 helped to found the Society of the Friends of the People, whose object was the reform of the representative system. Taking advantage of the alarm caused by the French Revolution, Pitt suppressed the society, and at a later period Grey expressed regret for his share in the movement. Grey introduced the futile motion for the impeachment of Pitt, and took a prominent part in the temporary 'secession' of the Whigs from a parliament which was hostile to reform, and which he and his friends maintained did not represent the nation. He also strongly denounced the union between England and Ireland. On the advent of the Fox-Grenville administration in 1806, Grey, now Lord Howick, was appointed First Lord of the Admiralty, and on the death of Fox he became Foreign Secretary and leader of the House of Commons. Grey was compelled by circumstances to continue the war policy of Pitt. To his honour he carried through parliament the act abolishing the African slave-trade introduced by Wilberforce in 1807. The king quarrelled with his ministers on the Catholic relief question, and as Grey declined to give a promise not to press forward a measure for absolving Roman Catholics in the army and navy from the oath, the government was broken up.

In 1807 he succeeded his father as second Earl Grey. He ably led the Opposition for a period of

eighteen years after the death of Perceval. He opposed the renewal of the war in 1815; denounced the coercive measures of the government against the people; condemned the bill of pains and penalties against Queen Caroline; defended the right of public meeting; and supported the enlightened commercial policy of Huskisson. He declined to lend any aid to Canning in 1827. Two years later he had the gratification of seeing the Catholic Emancipation Act carried. On the fall of the Wellington administration in 1830, Grey accepted the commands of William IV. to form a government in which he became prime minister and First Lord of the Treasury. It was understood that parliamentary reform was to be treated as a cabinet question, and the new premier announced in the House of Lords that the policy of his administration would be one of peace, retrenchment, and reform. The first reform bill was produced in March 1831, but its defeat led to a dissolution and the return of a House of Commons still more thoroughly devoted to the cause of reform. A second bill was carried, which the Lords threw out in October, and riots ensued in various parts of the country. Early in the session of 1832 a third bill was carried in the Commons by an enormous majority, and it weathered the second reading in the Upper House; but when a motion by Lord Lyndhurst to postpone the disfranchising clauses until the enfranchising clauses had been discussed was adopted, ministers resigned. The Duke of Wellington was charged to form an administration, but upon his failure Grey returned to office with power to create a sufficient number of peers to carry the measure. Wellington now withdrew his opposition, and on the 4th of June the Reform Bill passed the House of Lords. Grey was the chief of a powerful party in the first reformed parliament, but he was not destined long to remain at the head of affairs. One other great measure, the act for the abolition of slavery in the colonies, he carried, as well as a number of minor reforms; but dissensions sprang up in the cabinet, and in consequence of his Irish difficulties Grey resigned office in July 1834. He now ceased to take any active part in politics, and spent his closing years chiefly at Howick, where he died, 17th July 1845. Grey was a chivalrous, able, and high-minded man. While not in the first rank of parliamentary orators, his speeches on those subjects in which he was deeply interested frequently attained to real eloquence. Though he was the leader of the aristocratic Whigs, his greatest claim to remembrance in history is the fact that he opened the portals of the Constitution to the people. See George Grey, *Life and Opinions of the second Earl Grey* (1861).

His son HENRY GREY, third Earl, was born December 28, 1802. He was educated at Trinity College, Cambridge, and in 1826, as Lord Howick, was returned to the House of Commons for Winchelsea. He next sat for a brief period for Higham Ferrers, and after the passing of the Reform Bill of 1832 was elected for North Northumberland. He was appointed Under-secretary for the Colonies in his father's ministry, but retired in 1833 because the cabinet would not support the immediate emancipation of the slaves. He subsequently held for a short time the post of Under-secretary in the Home Department, and in Melbourne's administration of 1835 became Secretary for War. In 1841 he was rejected for Northumberland, but returned for Sunderland, and now opposed Peel's policy. He succeeded his father in the peerage in 1845, and in the following year entered Lord John Russell's cabinet as Secretary for the Colonies. After the resignation of the government in 1852, he published his *Defence of the Colonial Policy of Lord Russell's Administration*. He now took his seat on the cross-benches, and never afterwards held office. He opposed the Crimean war, and at a later period condemned the eastern policy of Lord Beaconsfield. He also frequently adopted a hostile attitude towards Mr Gladstone, to whom he was especially opposed at the general election of 1880. For many years past Lord Grey rarely spoke in the House of Lords, but from his retirement he wrote trenchant letters to the *Times* upon public affairs, and notably on colonial questions. In 1858 he issued his *Essay on Parliamentary Government as to Extent*, in 1867 he published his father's *Correspondence with William IV.*; and on various occasions he has printed speeches and letters of his own, including those to the *Times* on 'Free Trade with France,' which appeared in 1881. He died 9th October 1894.

Grey, SIR GEORGE, Baronet, English statesman, was the son of the first baronet, and nephew of the great Reform leader, Earl Grey. Born at Gibraltar, May 11, 1799, he was educated at Oriel College, Oxford, where he took a first-class in classics. He was called to the bar at Lincoln's Inn in 1826, but relinquished the law after succeeding to the baronetcy in 1828. In 1832 he was returned to the House of Commons for Devonport, which he continued to represent for fifteen years. He was appointed Under-secretary for the Colonies in 1834, having already made his mark in parliament, and Lord Melbourne reappointed him to the same office in 1835. For some years his chief speeches were delivered in connection with Canadian affairs and the constitutional difficulties in Jamaica. When Lord John Russell brought in a bill for the temporary suspension of the Lower Canadian constitution, Grey ably defended the measure against Mr Roebuck, who had been heard at the bar in opposition to the bill. In 1839 Grey became Judge-advocate, an office which he exchanged in 1841 for that of Chancellor of the Duchy of Lancaster, but the same year he went out of office with his colleagues. When Lord John Russell became premier in 1846, Grey accepted the onerous post of Home Secretary. During the time of the Chartist disturbances he discharged the difficult duties of his office with vigour and discrimination, this being the culminating point of his career as a practical and administrative statesman. He carried in the teeth of much opposition the Crown and Government Security Bill, a measure providing for the more effectual repression of seditious and treasonable proceedings. The Alien Bill was also under his charge. Owing to Grey's measures in view of the Chartist demonstration in London in 1848, when 150,000 special constables were sworn in, a threatened popular rising was averted. In consequence of the condition of Ireland, Grey carried a measure in 1849 for the further suspension of the Habeas Corpus Act. Three years later the Russell ministry was wrecked on the Militia Bill. At the general election in August 1847 Grey was returned for North Northumberland, but, being defeated at the election in July 1852, he was elected for Morpeth in the following January. In June 1854 he accepted the seals of the Colonial Office, and on the formation of Lord Palmerston's first administration in 1855 took his old post of Home Secretary. He carried an important measure on the subject of secondary punishments, in which the ticket-of-leave system was remodelled. On the return of Lord Palmerston to office in 1859, after his defeat in the previous year on the Conspiracy Bill, Grey was appointed Chancellor of the Duchy of Lancaster; but in 1861 he once more returned to the Home Office. He introduced and carried through several useful measures, including the Prison Ministers Bill. After the death of

Palmerston he continued in office under Earl Russell, carrying measures for stamping out the cattle plague, for amending the Parliamentary Oaths Act, and for suspending the Habeas Corpus Act in Ireland at the time of the Fenian activity. On the defeat of the Russell-Gladstone ministry in 1866 upon the reform question, Grey's official career closed; but he continued to sit in parliament until 1874, when he finally retired from public life. He died at his seat of Falloden, near Alnwick, September 9, 1882.—His grandson and successor, SIR EDWARD GREY (born 1862), studied at Oxford, became Radical M.P. for part of Northumberland in 1885, and in 1892–95 was Foreign Under-Secretary.

Grey, SIR GEORGE, K.C.B., governor and commander-in-chief of New Zealand, was born at Lisbon, in Portugal, in 1812. He was educated at the Royal Military College at Sandhurst, and on attaining his captaincy undertook in 1837 the exploration of the interior of Australia. In September 1838 he organised another expedition to explore the Swan River district. He returned to England in 1840, and published his *Journals of Two Expeditions in North-western and Western Australia*. His enterprise and ability obtained for him, unasked, in 1841, from Lord J. Russell, then Colonial Secretary, the post of governor of South Australia. In 1846 he was made governor of New Zealand. Both here and in Australia his first task was to acquire the language of the natives, with whom he became more popular than any preceding governor. His government appeared to the authorities at home to be so wise and conciliatory that in 1848 he was made K.C.B. (civil), and in 1854 was appointed governor and commander-in-chief of the Cape of Good Hope. The task of allaying the asperities and irritation left by the Kaffir war demanded high powers of statesmanship; Grey was, however, equal to the occasion. Industry revived, and brighter days began to dawn upon the colony. In 1858, however, the Colonial Office interfered with measures which he considered necessary, and he threw up his post and came to England. Public opinion at the Cape was so strongly manifested in his favour that he was requested by the government to resume his governorship. On the breaking out of the Indian mutiny Grey sent every soldier he could spare to the assistance of the Indian government, and received the acknowledgments of the British government and parliament for his promptitude and energy. In 1861 he was again appointed governor of New Zealand, in the hope that he would bring the war then raging in the colony to a satisfactory conclusion. The natives received him with joy and veneration, and he succeeded in bringing about pacific relations with the Maoris. He resigned his office and came to England in 1867, but afterwards returned to the colonies. Grey accepted the office of Superintendent of Auckland in 1875, with a seat in the Legislature, and he strongly but fruitlessly opposed the Abolition of the Provinces Act. After its passing his office of superintendent ceased; but in 1877 he became premier of New Zealand, and carried various acts of great practical utility. Grey had almost unbounded influence with the Maori chiefs, which he used in cultivating friendly relations between the natives and the white population. He resigned in 1884, but lived till 19th September 1898. He published *Journals of Discovery in Australia* (1841), *Polynesian Mythology* (1855), and *Proverbial Sayings of the Ancestors of the New Zealand Race* (1858). See Lives by Rees (3d ed. 1893) and Milne (1899).

Grey, LADY JANE, the 'nine days' queen,' was born at Bradgate, Leicestershire, in October 1537. She was the eldest daughter of Henry Grey, Marquis of Dorset, who in 1551 became Duke of Suffolk, and of Lady Frances Brandon. The latter was the daughter of Charles Brandon, Duke of Suffolk, by Mary, younger sister of Henry VIII., and widow of Louis XII. of France. Lady Jane was brought up rigorously by her parents, every petty fault punished with 'pinches, nips, and bobs;' but Aylmer (q.v.), her tutor, afterwards Bishop of London, endeared himself to her by his gentleness, and under him she made extraordinary progress, especially in languages—Latin, Greek, French, Italian, and Hebrew. Roger Ascham tells how in December 1550 he found her reading Plato's *Phædo* in the original, while the rest of the family were hunting. She also sang and played well, and was versed in other feminine accomplishments. In 1553, after Somerset's fall, the Duke of Northumberland, foreseeing the speedy death of the boy-king Edward VI., determined to change the succession and secure it to his own family. Lady Jane, not sixteen years old, was therefore married, strongly against her wish, to Lord Guildford Dudley, Northumberland's fourth son, on 21st May 1553; and on 9th July, three days after Edward's death, the council informed her that his 'plan' had named her as his successor. On the 19th, the brief usurpation over, she found herself a prisoner in the Tower; and four months later, pleading guilty of high-treason, she was sentenced to death. She spurned the idea of forsaking Protestantism for love of life, and bitterly condemned Northumberland's recantation: 'Woe worth him! he hath brought me and our stock in most miserable calamity by his exceeding ambition.' Queen Mary might have been merciful; but Suffolk's participation in Wyatt's rebellion sealed the doom of his daughter, who on 12th February 1554 was beheaded on Tower Hill. She was 'nothing at all abashed, neither with fear of her own death, which then approached, neither with the sight of the dead carcass of her husband, when it was brought into the chapel—a sight to her no less than death.' From the scaffold she made a speech: 'The fact, indeed, against the queen's highness was unlawful, and the consenting thereto by me; but touching the procurement and desire thereof by me or on my behalf, I do wash my hands thereof in innocency. . . . I die a true Christian woman.' With Lord Guildford she is buried in the Tower church of St Peter ad Vincula. See the articles EDWARD VI. and MARY; also *The Chronicle of Queen Jane*, edited by J. G. Nichols for the Camden Society (1850).

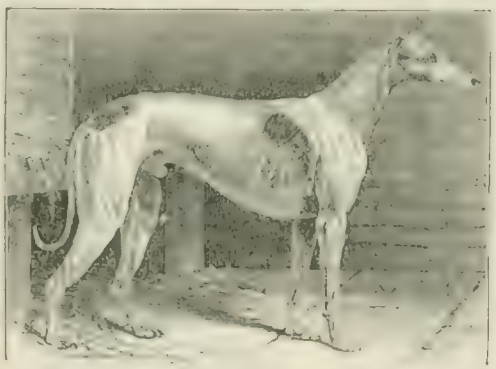
Greybeard.

Greybeards are big-bellied, narrow-necked stoneware jugs or bottles, made in Flanders about the beginning of the 17th century, and so called from generally having a grotesque head, with a large, square-cut beard, modelled on the short neck. The face was a Protestant burlesque of Cardinal Bellarmine's.

Grey Friars. See FRIAR, FRANCISCAN.

Greyhound, a breed of great antiquity, the only breed of dog which has retained its original

shape; many Egyptian monuments are decorated with figures of dogs closely resembling the smooth English greyhound. The greyhound has been known in England since the time of King Canute, who confined its use to the nobility by statute. Until comparatively modern times only land owners were permitted to use the greyhound. When the game-laws were relaxed, coursing became open to all, until now upwards of five thousand greyhounds are kept for public Coursing (q.v.). Clubs were formed for the encouragement of the sport, and a scale of points by which competing greyhounds could be tested was arranged. When it is desired to test two rival greyhounds, they are placed in the hands of the 'slipper,' towards whom the hares are driven. After getting the dogs in a straight line behind the hare, he liberates them by means of a mechanical contrivance, allowing the hare from 50 to 80 yards start. The 'judge,' who follows on horseback, then notes the points scored by either greyhound, giving his decision, from which there is no appeal, at the end of each course. The scale of points adopted is as follows: 'the run-up,' first reaching the hare, one to three points, according to lead gained; 'the turn,' causing the hare to turn at an acute angle, two points; 'the wrench,' turning at an obtuse angle, one point; 'the go-by,' starting behind a competitor and passing him, two points; 'the trip,' knocking the hare over but not killing, one point; 'the kill,' not more than two points, sometimes none, according to merit. Many greyhounds, after they have been repeatedly coursed, 'run cunning' or 'lurch'—i.e. allow their opponent to do all the work, only waiting for an opportunity to kill; this vice is hereditary, and must be guarded against in breeding. The greyhound is a large and graceful dog, conveying an impression of great speed. His



Greyhound.

head should be long and narrow, with powerful jaws; shoulders, sloping back, allowing free play for the fore-legs; fore-legs, strong and muscular; chest, deep and narrow; hind-legs, very long from hip to hock, and 'well-bent.' The points of the greyhound are neatly summed up in the 15th century rhyme:

> The head of a snake,
> The neck of a drake,
> A back like a beam,
> A tail like a stream,
> The foot of a cat,
> And the tail of a rat,

which is still a fairly accurate description. The greyhound is rarely kept as a companion, its intelligence not being of a high order. The Russian and Circassian greyhounds are identical in shape with the English greyhound, but much rougher in coat, and slower. The Italian and Turkish greyhounds are shaped very much the same way, but on a very reduced scale; they are used entirely as pets, being too delicate for any active work. See H. Dalziel, *The Greyhound: its History, Points, and Breeding* (1886).

Greymouth, a rising port of New Zealand, on the west coast of South Island, at the mouth of the Grey River, 190 miles SSW. of Nelson. Extensive harbour-works, including two breakwaters and the addition of 600 feet of wharf, have been erected since 1885, and railways to Nelson and Christchurch were commenced in 1887. The entire district is auriferous, and 55,036 ounces of gold (value £220,503) were exported during 1887–88. Greymouth, however, is famous chiefly for its coal, of which over 130,000 tons, of the best quality in Australasia, were raised in 1887 in the neighbourhood. Pop. (1891) 3787.

Greystone, a rock-term (now disused) for certain light gray lavas intermediate in character between trachytic and basaltic lavas. The greystones are probably all varieties of Trachyte (q.v.), but perhaps to some extent of liparite and even of basalt.

Greytown (*San Juan del Norte*), the only Nicaraguan port on the Caribbean Sea, is on the northern delta of the San Juan River, which until 1889 was nearly choked with sand. In that year labourers were despatched from the United States to commence work on the interoceanic canal, of which Greytown is the proposed terminus on the Atlantic side, and to construct a breakwater here. Greytown was neutralised under the Clayton-Bulwer treaty, and has been a free port of Nicaragua since 1860. Pop. 1500.

Greywacke (Ger. *Grauwacke*), a partially translated German word, used as the name of an indurated sedimentary rock, which occurs extensively among the Palæozoic systems, where it is associated with similarly indurated shales and conglomerates. It is an aggregate of rounded subangular and angular grains and splinters of quartz, felspar, and slate, sometimes with mica and grains of other minerals and rocks, embedded in a hard paste or matrix, which may consist of siliceous, calcareous, argillaceous, or felspathic matter. The rock is generally harder than most sandstones, and is usually gray or dark blue in colour, but green, red, brown, yellow, and even black varieties are met with. It varies in texture from fine-grained and compact up to conglomeratic and brecciiform, and occurs in thick massive beds like liver-rock (see SANDSTONE), and in thinner beds and layers like ordinary sandstones and flagstones. It represents the muddy sediments of the Palæozoic seas, and often retains ripple-marks, sun-cracks, worm burrows and castings, and other superficial markings.

Greywethers, the name given to large blocks of hard sandstone, which are scattered sporadically over the southern and south-eastern parts of England. The name has probably been suggested by their resemblance in the landscape to sheep lying about. Other names by which they are known are *Sarsden Stones*, *Druid Stones*. They are as a rule roughly oblong, and are of all sizes up to 10 or 15 feet in length, and 2 or 4 feet in thickness; and are believed to be the relics of beds of Eocene age which formerly extended over all the region where they occur. These beds probably consisted chiefly of loose sand, &c., the greywethers representing concretionary portions hardened by siliceous cement, which have thus withstood the denudation that has swept away the incoherent deposits of which they once formed a part. The outer ring of monoliths at Stonehenge is formed of greywethers.

Grieg, Edvard, a Norwegian composer, born at Bergen, 15th June 1843. He was of Scotch descent, his ancestors, Greigs, having emigrated from Fraserburgh during the Jacobite troubles. Grieg received instruction in music from his mother, till at the age of fifteen, on the recommendation of Ole Bull, he was sent to the Conservatorium at Leipzig. Thence, in 1863, after a severe illness, he went to Copenhagen, and afterwards to Christiania, where he was settled as a teacher for about eight years, and enjoyed the intimate friendship of Björnson and Ibsen. He visited Liszt in Rome in 1869. For a while a wanderer, he occupied for some years a romantic hut on the Hardangerfjord, and subsequently settled near Bergen. The Norwegian parliament conferred a pension on him to enable him to devote himself to composition. His works are mainly for the pianoforte, and in small forms, but embrace a sonata and a concerto for pianoforte, three violin and pianoforte sonatas, numerous songs, and a few orchestral and small choral pieces. Beyond that of any other composer, his music is characterised by the strongest national peculiarities, extreme gloom and brilliance alternating like the Norwegian summer and winter; its merriment is often wildly elfish in its freaks, and its pathos sometimes has a ghostly weirdness. He is as far removed from the commonplace as Chopin. He is of course immensely popular with his countrymen, and the great and growing favour with which he is regarded in England was strongly expressed on his visits in 1888, 1889, and 1897.

Grierson, Sir Robert, of Lag, persecutor of the Covenanters, was born about 1655, and succeeded his cousin in the family estates in 1669. He acted for some years as steward of Kirkcudbright, and carried out the infamous work of harrying the peasantry with such zest and vigour as to leave his name after two hundred years a byword in Galloway for ferocious cruelty. And his brutal speech to Kenmure about a martyr's body which he had denied the decency of burial: 'Take him, if you will, and salt him in your beef-barrel,' shows the popular tradition to be in harmony with fact. He was brother-in-law to the Duke of Queensberry, and through his influence was made a Nova Scotia baronet in 1685, and awarded a pension of £200. He was one of the judges of the Wigtown martyrs, and his name survives in infamy upon their tombstone. After the Revolution he was heavily fined and imprisoned for his obstinate opposition, and later was charged with coining false money when experiments in stamping linen alone were in question! He died 31st December 1733. A rough but really vigorous piece of verse, *Lag's Elegy*, was current in Dumfriesshire soon after his time, and was admired in the next century by Carlyle. The popular imagination wove many a gloomy and awful fancy around Lag's memory, and all the most effective of these Scott worked with marvellous art into 'Wandering Willie's Tale'—a magnificent phantasy of genius. Old Redgauntlet, with the horseshoe frown upon his brow, and his pre-eminence among the damned in hell, is but a creative realisation of the Laird of Lag traditional in Galloway. See Colonel Fergusson's book, *The Laird of Lag: a Life Sketch* (1886).

Griesbach, Johann Jakob, author of the first critical edition of the New Testament, was born at Butzbach, in Hesse-Darmstadt, January 4, 1745. He studied theology at Tübingen; at Halle, where Semler influenced his whole after-life; and at Leipzig, where he became acquainted with Ernesti. He commenced lecturing as *privat-docent* in Halle, and in 1773 was made extra-ordinary professor; but in 1776 he was called as ordinary professor to Jena, where he continued to teach with great success till his death on 24th March 1812. The great work with which his name is associated is his critical revision of the New Testament text. Amongst his notable works are the *Synopsis Evangeliorum* (2 vols. 1774–75; 3d ed. 1809); his edition of the whole New Testament (1775; new ed. 1796–1806); *Populäre Dogmatik* (1779; 4th ed. 1789); *Commentarius Criticus in Textum N. Test.* (1798–1811); and the *Opuscula Academica* (1825). The grand feature of Griesbach's critical system is his threefold division or classification of the New Testament MSS.: (1) The Alexandrine recension; (2) the Latin or Western recension; (3) the Byzantine or Eastern recension. See Bible; and the Lives by Köthe (1812), Augusti (1812), and Eichstädt (1815).

Griffin (Lat. *gryphus*; Gr. *gryps*), a chimerical creature, first mentioned by Aristeas about 500 B.C. The griffin is variously described and represented, but the shape in which it most frequently appears is that of a cross between a lion and an eagle, having the body and legs of the former, with the beak and wings of the latter, and the addition of pointed ears. Sometimes the four legs are all like those of an eagle, and the head is that of a cock. The figure seems to have originated in the East, as it is found in ancient Persian sculptures. Amongst the Greeks it appears on antique coins, and as an ornament in classical architecture. Griffins abound in the legendary tales of the Teutonic nations, and the name (Ger. *greif*, Dan. *grif*, &c.) has passed into most Teutonic dialects. In the bestiaries of the middle ages the appearance and habits of the griffin were discussed with much particularity; it was the emblem of vigilance, and was understood to guard hidden treasures in Bactria; and the griffin (or gryphon) is still familiarly known to heraldry. As such it appears in the arms of the city of London, griffins being the supporters; and on the removal of Temple Bar a sculptured griffin was erected on the site (November 1880). For the Griffin Vulture, see Vulture.—Griffin is a name jocularly given in India to a newcomer from England, a greenhorn.

Griffin (Heraldry).

Griffin, Gerald, novelist, was born at Limerick, 12th December 1803, and early began to write for the papers and magazines. He came to London in 1823, resolved to 'revolutionise the dramatic taste.' Of course he failed to get his tragedies acted, but he was more successful with novels—*Holland Tide* (1827), *Tales of the Munster Festivals* (1827), and *The Collegians* (1828), on which the drama of the *Colleen Bawn* is founded. These were followed by some dozen more novels and many minor tales. Griffin joined the Society of Christian Brothers, and died in the North Monastery, Cork, 12th June 1840.

Griffith's Valuation, the main authority for the adjustment of rents under the Irish Land Act, was calculated by Mr (afterwards Sir) Richard Griffith, appointed commissioner to carry out the scheme resolved on by the government in 1825. The results were first published in 1850, and have been much discussed in recent years; but the valuation may be regarded as a most minute and exact basis for equitable taxation and the fixing of fair rents.

Grig, or Glut (*Anguilla latirostris*), a widely distributed species of eel, found on British and European, Chinese, West Indian, and other coasts. See Eel.

Grigoriopol, a town of Kherson, South Russia, on the left bank of the Dniester, 82 miles NW. of

Odessa. Its 7918 inhabitants cultivate tobacco, wine, and fruit, and manufacture leather.

Grille, a lattice, or grating, or screen, or open work of metal, sometimes also of wood, generally used to enclose or protect a window, or some shrine, or tomb, or sacred spot. A grille should be all hammered and punched, without filing. The small screen of crossed iron bars inserted in the door of a monastery or prison, for holding conversation and reconnoitring through, is also called a grille.

Grillparzer, FRANZ, an Austrian dramatic poet, for some time popularly regarded as the greatest poet of his nation, was born at Vienna, 15th January 1791, and laboured in the imperial civil service from 1813 to 1856. He died 21st January 1872 at Vienna. Grillparzer first attracted notice in 1816 by a 'fate' tragedy, *Die Ahnfrau*. His next tragedies, *Sappho* (1819) and *Das goldene Vlies* (1821), the latter a trilogy, are beautiful pieces of work, modern in sentiment, classic in style. And the same features, with that of lyric force added, characterise the dramas *Des Meeres und der Liebe Wellen* (1840) and *Der Traum ein Leben* (1840). Besides these he wrote the historical plays *König Ottokar's Glück und Ende* (1825) and *Ein treuer Diener seines Herrn* (1830), with others. In lyric poetry he likewise produced a good deal of meritorious work; and he wrote one good prose novel, *Der Spielmann*. A collected edition of his works, including an autobiography, was published in 10 vols. at Stuttgart in 1872, and another of 16 vols. in 1889. See Lives by Faulhammer (1883) and Laube (1884), and works by Volkelt (1889) and A. Farinelli (1895).

Grilse. See SALMON.

Grimaldi. See MONACO.

Grimaldi, JOSEPH, the typical representative of 'the genuine droll, the grimacing, filching, irresistible clown' of the English pantomime, was born in London on 18th December 1779, the year in which Garrick died. He first appeared on the boards of Drury Lane when one month short of two years old, and in his third year he had his first engagement at Sadler's Wells Theatre, where he regularly performed (except for one season) down to the date of his retirement from the stage, prematurely worn out by sheer hard work, in 1828. He used regularly for some months every year to perform nightly at two theatres, and once he achieved the feat of acting at three different theatres on the same night. He died in London, 31st May 1837. See *Memoirs of Joseph Grimaldi*, edited by Charles Dickens (1838).

Grime's Dyke. See ANTONINES' WALL.

Grimm, FRIEDRICH MELCHIOR, BARON, a clever German critic, who knew every one worth knowing at Paris in the later half of the 18th century. He was born at Ratisbon, 25th December 1723, and after completing his studies at Leipzig, and making an egregious failure with a tragedy, accompanied the young Count de Schönberg to Paris, and soon after became reader to the Crown-prince of Saxe-Gotha. He was still in very straitened circumstances when he became acquainted with Rousseau in 1749, and was by him introduced to Diderot, Baron Holbach, and Madame d'Epinay. The intimacy of his relations with this lady cost him later the friendship of the jealous Rousseau. Grimm quickly became a general favourite, and his connection with the Encyclopédistes, added to his own multifarious acquirements and versatility of mind, opened up to him a brilliant career. He became secretary to Count Friesen, next to the Duke of Orleans, and now began to write for several German princes those famous literary bulletins which cover about forty years, and contain the most trenchant criticism of all the most important of current French books. In 1776 he was raised by the Duke of Gotha to the rank of baron, and appointed minister-plenipotentiary at the French court. On the breaking out of the Revolution, he withdrew to Gotha, and afterwards to the court of Catharine II. at St Petersburg whence he was sent in 1795 as minister of Russia to Hamburg. He died at Gotha, 19th December 1807. His *Correspondance Littéraire, Philosophique et Critique*, extending from 1753 to 1790, was published in three divisions (16 vols. 1812-13); a supplementary volume in 1814. Later editions are those by Taschereau (15 vols. 1829-31), and Tourneux (16 vols. 1878-82). The *Correspondance inédite de Grimm et Diderot* was published in 1829. See Sainte-Beuve, *Études sur Grimm* (1854); and Edmond Scherer's *Melchior Grimm* (Paris, 1887).

Grimm, JAKOB LUDWIG KARL, the founder of scientific German philology, and one of the noblest of ancient or modern scholars, was born January 4, 1785, at Hanau, in Hesse-Cassel. He studied law at Marburg, and learnt scientific method from Savigny, at whose invitation he spent the greater part of the year 1805 in study at Paris. On his return he was appointed to a clerkship in the war-office, and in 1808, private librarian to Jerome Bonaparte, king of Westphalia, who also made him auditor to the council of state. His brother Wilhelm had also by this time settled at Cassel. The first fruit of his studies was the treatise *Ueber den Altdeutschen Meistersang* (1811), which was followed in 1812 by the first volume of the famous *Kinder- und Hausmärchen*, collected by the two brothers—a work which has carried their name over the civilised world in the happiest and most enduring kind of immortality, and has formed a foundation for the new science of comparative Folklore (q.v.). Nor has a contribution to storiology since been made equal in importance to the earliest. The second volume followed in 1814; the third, containing the notes, in 1822. In 1813 Grimm was secretary to the ambassador of the Elector of Hesse, whom he attended at Paris, and at the Congress of Vienna. In 1815 he was sent to Paris to claim the books carried off by the French. His brother Wilhelm had already received a post in the Cassel library, and in 1816 Jakob became second librarian under Völkel, on whose death in 1828, the two brothers being disappointed of the first and second places in the library, removed to Göttingen, where Jakob became professor and librarian, and Wilhelm under-librarian. Here for seven years he studied the language, ancient laws, history, and literature of Germany, but never made an effective lecturer. He was one of the famous seven professors who protested in 1837 against the abolition of the constitution by the king of Hanover, for which act he was dismissed, together with his brotker, and obliged to retire to Cassel. In 1840 they were both invited to Berlin, where they received professorships, and were elected members of the Academy of Sciences. Here Jakob continued his studies with the most single-minded devotion, producing a series of works still unsurpassed for their stupendous erudition. Working up to the last with a devotion undivided by wife or children, he died 20th September 1863.

His *Deutsche Grammatik* (1819; 2d ed. entirely recast, Gött. 1822-40) is perhaps the greatest philological work of the age, and may be said to have laid the foundation of the *historical* investigation of language. It traces the German language historically through all its dialects. His *Deutsche Rechts-Alterthümer* (1828; 2d ed. 1854) and *Deutsche Mythologie* (1835; 3d ed. 1854; 4th ed. by Meyer, 1875-78; Eng. trans. by J. S. Stallybrass, 4 vols. 1879-88) are works of exhaustive

erudition upon the society of the middle ages in central Europe, and the religious traditions and superstitions of the Teutonic races from the earliest times. Only less important is his *Geschichte der Deutschen Sprache* (1848; 3d ed. 1868), and his *Reinhart Fuchs* (1834). In company with his brother Wilhelm he published many editions of old German classics, *Deutsche Sagen* (1816-18; 2d ed. 1865-66); and projected and commenced the great and still unfinished *Deutsches Wörterbuch* (vol. i. 1854; three-fourths finished by 1897, with the collaboration of Heyne, Hildebrand, Lexer, and Weigand). The first volume of Grimm's *Kleinere Schriften* (8 vols. 1867-86) contains an autobiography which reveals a character entirely free from jealousy or envy, full of warm human sympathy, and combining in an almost unexampled degree a noble simplicity of life with lofty elevation of purpose. Many collections of his letters have been printed. See the studies by Scherer (2d ed. 1884), Berndt (1884), and those devoted to the two brothers by A. Duncker (1884) and Schönbach (1885).

Grimm's Law is the name given to the rule which regulates the *Lautverschiebung*, or permutation of certain primitive consonants, which takes place in the Teutonic languages. The law, as finally formulated by Jakob Grimm, is that if the same roots or words exist in Sanskrit, Greek, and generally in Latin, Celtic, Lettic, and Slavonic, and also in Gothic, English, Dutch, and other Low German dialects on the one hand, and in Old High German on the other, the following correspondences are to be expected: (1) Gothic has a soft mute, and High German a hard mute, in place of the corresponding aspirate in Sanskrit and Greek; (2) Gothic has a hard mute, and High German an aspirate, in place of the corresponding soft mute in Sanskrit and Greek; (3) Gothic has an aspirate, and High German a soft mute, in place of the corresponding hard mute in Sanskrit and Greek. Thus, a primitive *th* becomes *d* in Low German, and *t* in High German, as in the words *th*ugatēr, *d*aughter, *t*ochter. A primitive *d* becomes *t* in Low German, and *z* in High German, as in *d*uo, *t*wo, zwei; or *d*ens, *t*ooth, zahn; or *d*ecem, *t*en, zehn. A primitive *t* becomes *th* in Low German, and *d* in High German, as in *t*res, *th*ree, *d*rei; or *t*u, *th*ou, *d*u; or *t*enuis, *th*in, *d*ünn. Similar changes affect the labials and gutturals, as in *p*ecus, *f*ee, vieh; *p*ater, *f*ather, vater; *f*agus, *b*eech, *p*uoche; and in *o*culus, *e*ye ('eye'), auge; *qu*is, *wh*o, wer; or *ch*ortos, *g*arden, *h*orto. The normal changes are set forth in the following table:

	Labials.			Dentals.			Gutturals.		
Greek, &c.	p	b	ph	t	d	th	k	g	kh
Gothic, &c.	f	p	b	th	t	d	(h)	k	g
Old High German.	b(v)	f	p	d	z	t	g(h)	ch	k

The credit of the discovery of the *Lautverschiebung* is not wholly due to Jakob Grimm. Thre and Rask had discovered, as early as 1818, the law of the transmutation of consonants in Greek and Gothic, while Grimm, in the second edition of his *Deutsche Grammatik*, which appeared in 1822, added the corresponding changes in Old High German, and formulated the Law as it now stands.

Grimm's Law may be interfered with by the action of other laws, especially by the position of the accent, as formulated in Verner's Law (q.v.). Thus *frāter* is accented on the first syllable and *patēr* on the second, consequently, though we have *brother* and *father* in English, we find *bruder* and *vater* in High German. The accent in *patēr* has interfered with the regular action of the *Lautverschiebung*, and prevented the normal change of *t* to *d* from taking place.

Thus Grimm's Law may be defined as the statement of certain phonetic facts which happen invariably unless they are interfered with by other facts. The great use of Grimm's Law, in addition to the identification of words in different languages, is in the detection of loan words. Any etymology which violates Grimm's Law, as qualified by other phonetic laws, must be rejected unless it can be explained as a loan word.

The causes which brought about the changes formulated in Grimm's Law are obscure. They are probably due to the settlement of Low German conquerors in central and southern Germany.

See Douse's *Grimm's Law: a Study of Lautverschiebung* (1876); Max Müller's *Lectures on the Study of Language*, 2d series, lecture v. (1864); Morris' *Historical Outlines of English Accidence*, chap. ii. (1872).

Grimm, Wilhelm Karl, brother of the preceding, was born at Hanau, February 24, 1786. Great part of his life has already been told in that of his brother. He was his companion in study at the Lyceum of Cassel, the university of Marburg, and again at Göttingen, where in 1830 he was appointed under-librarian and supernumerary professor of Philosophy. He joined his brother in the protest against the king of Hanover, shared his exile, and also his call to Berlin. There they laboured together, and were commonly known as the Brothers Grimm. Under that name also they have a certain immortality in the affections of the children of the civilised world. Wilhelm died 16th December 1859. His earliest independent work was a German translation of the Danish *Kompe-Viser* (1811-13). He edited many old German texts, and collaborated with his brother Jakob in several of his works. His own most important book is *Die deutsche Heldensage* (1829; 2d ed. 1867). His *Kleinere Schriften*, ed. by Hinrichs, fill 4 vols. (1881-86), and contain an autobiography.

Grimma, a town of Saxony, on the Mulde, 19 miles SE. of Leipzig by rail. It has a town-hall (1442), a former royal castle (now a court-house), a celebrated school (1550, the 'Moldanum Illustre'), and 8992 inhabitants, who support themselves by manufactures and agriculture. See Bora, K. von.

Grimmelshausen, Johann Jacob Christof von, a German novelist of the 17th century. There is some uncertainty as to the date and place of his birth, but in all probability he was born at Gelnhausen in Hesse-Cassel about the year 1625. In early boyhood he was carried off by a troop of soldiers, and became a soldier himself, serving on the imperial side in the Thirty Years' War up to its close. For several years after the end of the war he seems to have led a wandering life, but ultimately settled down at Renchen, near Kehl, where he held the post of bailiff for the Bishop of Strasburg, and passed the remainder of his days in peace and prosperity, dying Amtmann of the town in 1676. In the leisure of his later life he produced a series of remarkable novels, all the more remarkable for appearing in the sterile period that succeeded the Thirty Years' War. His first attempt was an imitation of Cyrano de Bergerac, or perhaps of Godwin's *Voyage of Domingo Gonsales to the Moon*, but his best works are on the model of the Spanish picaro, or rogue and vagabond romances, and deal with the abundant materials furnished by his own life. The form was all that he borrowed; the rich humour, dramatic power, and local colour of his tales are all his own. The sufferings of the German peasantry at the hands of the lawless troopers who overran the country have never been more powerfully pictured than in the opening chapters of *Simplicissimus* (first printed in 1669), which is evidently autobiographical to a great extent. It was followed in 1670 by *Trutz Simplex*, the story of an adventuress of the same sort as the *Picara Justina* of Andres Perez, and *Springinsfeld*, the history of a soldier of fortune, which was

succeeded in 1672 by the *Wonderful Bird's nest*, a fanciful production somewhat like Guevara's *Dial of Princes*. Besides these Grimmelshausen wrote the *Ewig währender Calender*, and three or four other tales or tracts. His writings, especially *Simplicissimus*, seem to have been very popular in his own time, but to have fallen into neglect in the last century. Their merits, however, have been recognised of late years, and the best of them have been reprinted with introductions and notes, e.g. in the edition of Von Keller (4 vols. Stutt. 1854–62), that of Heinrich Kurz (4 vols. Leip. 1863), and of Julius Tittman (4 vols. Leip. 1874–77).

Grimoire (whence the English *grammar*, 'magic'), the French term for the book of formulas which sorcerers used for invoking demons; hence also gibberish. The older forms of the word (*gramaire*, *gramaire*) approximate to the Low Latin *gramma*, 'a letter;' the origin of the word being obvious.

Grimsby, or GREAT GRIMSBY, a parliamentary, municipal, and county borough and seaport of Lincolnshire, is situated on the right bank of the Humber, 20 miles ESE. of Hull and 41 NE. of Lincoln. It consists of two portions: the older, comprising a number of streets irregularly laid out, is at the head of the harbour; and the newer part, called the 'Marsh,' extending along the east side of the harbour, is regular and spacious. The parish church, a good cruciform edifice in the Early English style, was restored in 1859. A statue of the Prince Consort was unveiled in 1879, and a public park of 27 acres opened in 1883. In the time of Edward III. Grimsby was a port of considerable importance, which, however, it gradually lost as its harbour became silted up. The town is famous as the largest fishing port in the kingdom, its trawlers and smacks being mostly engaged in the cod, herring, and whelk fisheries. Its importance as a place for the landing of fish dates from 1849–58, when docks began to be constructed under the auspices of the Manchester, Sheffield, and Lincolnshire Railway, which carries the fish to the principal industrial centres of the northern Midlands. The docks cover altogether an area of about 350 acres. The industries of the place include shipbuilding, tanning, brewing, cordage-making, and flax-dressing. About 3500 vessels, with an average burden of 675,000 tons, enter every year, and the number and burden of those clearing annually are about the same. The imports of the port reach the annual value of 4½ millions sterling, and the exports 7¾ millions. Grimsby since 1832 has returned only one member to parliament. Pop. (1851) 12,263; (1871) 28,503; (1891) 58,603, of whom 51,876 were within the municipal boundary. See works by Oliver (1825) and Davenport (1866).

Grindal, EDMUND, Archbishop of Canterbury, was born near St Bees in 1519, and educated at Cambridge, where he was in turn scholar, fellow, and master of Pembroke Hall. Already a prebendary of Westminster under Edward VI., he lived abroad during Mary's reign, and there imbibed the spirit of Geneva, returning to England on the accession of Elizabeth. On Bonner's deprivation in 1559 he was made Bishop of London, in 1570 Archbishop of York, and in 1575 he succeeded Parker in the see of Canterbury. His Puritanistic sympathies soon estranged him from the court, and his resolute refusal to put down against his own conscience 'prophesyings' or private meetings of the clergy for mutual help in the interpretation of Scripture, led to his being sequestered from his functions by the imperious queen in 1577. Not for five years was he restored, and a year later he died at Croydon, July 6, 1583. 'Being really blind,' says Fuller, 'more with grief than age, he was willing to put off his clothes before he went to bed, and in his lifetime to resign his place to Doctor Whitgift, who refused such acceptance thereof. And the queen, commiserating his condition, was graciously pleased to say that, as she had made him, so he should die an archbishop.' His few writings, with a Life by the Rev. William Nicholson, were printed by the Parker Society in 1853.

Grindelwald, one of the most beautiful valleys (3468 feet) of the Bernese Oberland in Switzerland, about 12½ miles long and 4 broad, forms the approach to the two Grindelwald glaciers. The chief hotel and part of the village (pop. 3089) were destroyed by fire on 18th August 1892.

Grinding. See CUTLERY.

Gringore, or GRINGOIRE, PIERRE, a favourite French poet under Louis XII. and Francis I., was born, perhaps at Caen, between 1475 and 1480, and early became known as a writer of moral and allegorical poems, next of satirical farces abounding in allusions to the social and political circumstances of the time. For the first twenty years of the 16th century he played the most important rôles in the theatrical society of 'Enfants sans Souci,' first as Mère Sotte, next as Prince des Sots; and as such was active in the production and representation of pantomimic satirical farces. He is an important figure in literary history as one of the creators of the French political comedy. He abused the enemies of Louis XII., and thus found cover for his freedoms against the vices of the nobility, the clergy, and even the sacred person of the pope himself. In later life he entered the service of the Duke of Lorraine as a herald, and confined his muse to religious poetry alone. He died in 1544. The most important among his pieces are *Le Jeu du Prince des Sots* (1511), directed especially against Pope Julius II.; *Les folles Entreprises*, a series of half allegorical monologues aimed at the chief existing grievances in church and state; *Les Entreprises de Venise*, and *La Chasse du Cerf des Cerfs*, both political, the title even of the latter being but a dimly-veiled allusion to Pope Julius (*Servus servorum Dei*); and the famous *Mystère de Monseigneur Saint Loys*, written about 1524. Gringore's works have been edited by Héricault, Montaiglon, and Rothschild (4 vols. 1858–77). He is the chief figure in a comedy of Banville's, but his description in Hugo's *Notre Dame* must not be taken as historical. See Picot, *Pierre Gringoire* (Paris, 1878), and another work by Badel (Nancy, 1893).

Grinnell Land, a barren, mountainous Polar tract on the west side of Kennedy Channel (the northern continuation of Smith's Sound), which separates it from Greenland. It was discovered by Dr Hayes of Kane's expedition in 1854, and named after Henry Grinnell (1800–74), of New York, who had fitted out the expedition. Greely in 1882 thoroughly explored it. North and south it is covered with ice-caps; between them lie valleys that get quit of their snow in summer, and support herds of musk oxen and the usual Arctic fauna. In the interior he discovered Lake Hazen, 60 miles long, and two ranges of mountains, one containing a peak (Mount Arthur) 5000 feet high.—Another Grinnell Land, discovered by De Haven in 1850, lies further to the south-west, off the north-west extremity of North Devon Island.

Grinstead, EAST, an old-fashioned town of Sussex, 36 miles S. by E. of London by rail, which till 1832 returned two members to parliament. Here is Sackville College, of which Dr Neale was warden, and the convent of the sisterhood of St Margaret, with Home and Orphanage. Pop. 5390. —WEST GRINSTEAD is 18 miles to the south-west.

Griping, or GRIPES, a popular name for all painful affections of the bowels, whether attended with Constipation (q.v.) or Diarrhœa (q.v.). When pains of this kind are spasmodic, they are termed Colic (q.v.). The action of purgative medicine is often attended by more or less of griping pain, which may be averted in certain cases by the careful choice of the medicine, or by combination of it with Carminatives (q.v.), or with a little opium.

Griqualand West and **East** are two British districts of South Africa, one a part of Cape Colony (q.v.), the other a dependency of it, and named from the Griquas or Bastaards, who are a mixed race sprung from Dutch settlers and native women.—*Griqualand West* lies to the north-east of Cape Colony, is bounded on the S. by the Orange River, on the N. by Bechuana territory, on the E. by Orange Free State, on the W. by the Kalahari country. Portions of the country are suitable for sheep-farming and agriculture, but the chief source of wealth is the diamond-fields. The first diamond was discovered in 1867, and from that time a steady stream of immigration set in; settlements were formed, all nationalities being represented, and digging was vigorously prosecuted. Diamonds to the value of above £12,000,000 were found there between 1871 and 1880, and of about £15,000,000 between 1883 and 1887. The territory of the diamond-fields had been secured to Waterboer, a native chief, but disputes arising as to his boundaries, Griqualand West was annexed in 1871, and incorporated with Cape Colony in 1880. Kimberley, which has had railway connection with the Cape since 1885, is the chief centre of the diamond industry, and is the seat of government. The chief towns are De Beers, Du Toit's Pan, Bultfontein, Barkly, and Griqua Town. The area of Griqualand West is 15,197 sq. m., and the pop. (1891) 83,375, of whom 29,670 were whites. *Griqualand East* is that part of No-Man's-Land which lies between the Kaffir border and southern Natal. It is allotted to the Griqua chief, Adam Kok, who had removed thither with 15,000 Griquas, and to the Basutos, who had previously migrated to that country. This territory was annexed to the Cape in 1875, and is now under colonial rule, having one chief-magistrate and nine subordinates. Chief village, Kokstadt. The area is given at 7594 sq. m.; pop. (1891) 152,618; of whites, 4150. See also TRANSKEI TERRITORY.

Griselda, or GRISELDIS, the heroine of one of the most famous medieval tales, which the genius of Boccaccio, Petrarch, and Chaucer has made a permanent literary possession of the world. She was the daughter of a poor Piedmontese peasant, and for her beauty was taken to wife by the Marquis Walter of Saluzzo. To prove her truth and humility, he put her to several cruel tests—tore both her children in succession from her, and at last commanded her to return to her humble hut, as he was about to take to himself another wife. To all her husband's harsh commands she submitted with such unquestioning submissiveness and humility as to make herself for all time 'the flour of wyfly pacience.' The marquis, overjoyed to see her complete devotedness and self-renunciation, took her again to his arms, gave her back the children she had seen carried off to death, and henceforth they lived together in uninterrupted happiness.

The first literary version of the story occurs as the last tale of Boccaccio's *Decameron*—the tenth tale of the tenth day, written doubtless about 1348. Petrarch wrote a Latin version of it, *De Obedientia et Fide uxoria mythologia*, written apparently about 1373. It is accompanied by a letter to Boccaccio, in which Petrarch says that the story had always pleased him when he heard it many years before. The stuff of the story is undoubtedly much older than Boccaccio, and certainly we soon find it widely diffused and highly popular. Reinhold Köhler enumerates as many as sixteen Volksbuch versions in German from the end of the 15th to the middle of the 17th century, all based upon Heinrich Steinhöwel's translation of Petrarch (1471). As a chap-book the story was almost as common in France in the version *Le Mirroir de Dames, ou la Patience de Griseldis, &c.*, to be found in Ch. Nisard's *Histoire de Livres Populaires* (2d ed. 1864). In England editions of such were entered on the Stationers' Registers in the years 1565 and 1568, and another of 1619 is still extant, under the title, *The ancient, true, and admirable History of Patient Grisel*, &c., reprinted for the Percy Society in 1842. Substantially the same story also appears in Danish, Russian, and Icelandic folk-tales.

The chief poetical version of the story of patient Griselda is that in Chaucer's *Clerkes Tale*, one of the noblest poems in its series, and recited by perhaps the most attractive figure in the group of pilgrims. Chaucer makes the Clerk say that he had learned the tale at Padua from the lips of Petrarch himself, and in all probability he identifies himself here with the Clerk, and speaks out his own personal experience, as he was absent in Italy on the king's business from the December of 1372 to the November of 1373. The poem is distinctly founded on Petrarch's moralised Latin version, but the poetical treatment of the story is so individual that it all comes afresh from the mind of Chaucer. We have a ballad of 'Pacyent Grissel' in Bishop Percy's *Folio MS.* (vol. iii. 1868); and we find her painted among the celebrated lovers on the walls of the temple in Lydgate's poem, *The Temple of Glass*. Indeed the beauty of the story, and its allegorical value as a lesson teaching the duty of submission to the will of God, quickly touched the popular imagination, and the patience of Griselda passed into a proverb, as we see in Shakespeare and *Hudibras*. Perrault's poem of 932 irregular rhymed verses is the chief poetic elaboration of the theme in French.

The earliest dramatic representation was an old French Mystery on the subject, composed about 1395. Of more modern plays, it is enough to mention Dekker, Chettle, and Haughton's *Pleasant Comedy of Patient Grissel* (1599; ed. by J. P. Collier for the Shakespeare Society, 1841); *El exemplo de Casadas y prueva de la Paciencia*, by Lope de Vega; Hâns Sachs' *Gedultig und gehorsam Marlygrafn Griselda* (1546); Goldoni's *La Griselda;* and Friedrich Halm's *Griseldis* (1834).

See Reinhold Kohler's article in Ersch and Gruber's *Encyklopedie*, and Dr Friedrich von Westenholz, *Die Griseldis-Sage in der Literaturgeschichte* (Heidelberg, 1888). Petrarch's Latin tale of *Griseldis*, with Boccaccio's tale from which it was retold, is reprinted in the Chaucer Society's *Originals and Analogues of Chaucer's Canterbury Tales*, part ii. (1875).

Grisi, GIULIA, a celebrated singer, was born at Milan in 1811, and made her first appearance in 1828, at Bologna, in Rossini's *Zelmira*. Her fame spread rapidly over Europe; in 1832 she appeared in Paris in *Semiramis*, where the purity, melodiousness, and volume of her voice, as well as her classical beauty of features (Heine wrote of her as 'the singing flower of beauty'), secured general admiration. Bellini's *Puritani* and other operas were written for her, but Norma always remained her greatest part. London was the scene of her grandest and most successful performances; and here she married in 1836 the Marquis de Melcy, after whose death she became in 1856 the wife of the tenor, Mario, with whom she sang in America. She died in Berlin, 28th November 1869.

Gris-nez. Cape, a headland (164 feet high) in the French department of Pas-de-Calais, opposite Dover, is the point of land nearest to the English shore, the distance being barely 20 miles. About equally distant from Calais on the north-east and Boulogne on the south, the cape marks the dividing line between the North Sea and the English Channel. It has a lighthouse.

Grison (also called *Huron*), a South American weasel (*Galictis vittata*), is somewhat larger than the European weasel.

Grisons (Ger. *Graubunden*), the largest and the most thinly peopled of the Swiss cantons, is bounded E. by Tyrol and S. by Lombardy. Area, 2773 sq. m.; pop. (1888) 94,810. Nearly half are Germans; next comes the characteristic Romansch (q.v.) element (37,000), with 13,000 Italians. More than half of the whole number are Protestants. The whole canton is an assemblage of mountains intersected by narrow valleys. These last form three groups, of which the first and most important lies along the course of the Rhine, and stretches northward, occupying nearly the whole of the western portion of the canton; the second, forming the Engadine (q.v.), extends north-east along the course of the Inn; and the third comprises several smaller valleys, whose streams run southward, belonging to the basins of the Ticino and the Adige. Pastures and forests occupy a large portion of the canton; cattle and timber are the principal exports. Numerous mineral springs are found within the canton; also the health-resorts of Davos, the Upper Engadine, Seewis, &c. Iron, lead, copper, zinc, and silver occur. Within the Grisons too are several passes leading to Italy, such as the Splügen, St Bernardino, Bernina. The canton is democratic in constitution (see Switzerland). The cantonal capital is Chur or Coire (q.v.).

The country was anciently inhabited by the Rhætii, who are supposed to have been of Etruscan race (see Etruria). It was conquered by the Romans under Augustus, and added by Charlemagne to his empire in 807. During the middle ages the Bishop of Chur was the most powerful of the numerous nobles who sought to oppress the people, till they in self-defence formed themselves into leagues. One of these leagues, formed in 1424, was called the *gray* league (Ger. *der graue bund*), from the gray home-spun worn by the unionists, and hence the German and French names of the canton Graubunden and Grisons. In 1471 these separate unions entered into a general federation, which then (1497-98) formed an alliance with the Swiss cantons. See works in German by Jecklin (6 vols. Coire, 1874-86).

Griswold, Rufus Wilmot, American editor, was born in Vermont, 15th February 1815. After extensive travels at home and in Europe, he learned printing and newspaper work, next became Baptist preacher, then journalist and compiler of books in turn at Philadelphia, Boston, and New York. The most important paper which he edited during his career, the *International Magazine*, was afterwards amalgamated with *Harper's Magazine*. Griswold died in New York, 27th August 1857. His books are numerous; but, despite his industry, he was but a poor literary critic. Here the following only can be named: *Poets and Poetry of America* (1842); *Poets and Poetry of England in the 19th Century* (1845); *Prose Writers of America* 1846); *Female Poets of America* (1848); and *The Republican Court, or American Society in the Days of Washington* (1854). He was one of Poe's executors, and the Life which he furnished to the edition of his works (3 vols. 1850) has occasioned much hostile criticism.

Grit, a coarse-grained arenaceous rock. See Sandstone, Carboniferous System.

Grizzly. See Bear.

Groat Old Low German *groot*, meaning *great*), a name given in the middle ages to all thick coins, as distinguished from the 'bracteates' or thin coins of silver or gold-leaf stamped so as to be hollow on one side and raised on the other. The silver groat current in England (introduced by Edward III.) was equal to four pence. The coin—not the name—was revived (1836-56) in the modern fourpenny-piece. Groschen, the German equivalent of groats, were till 1873-76 current in the north of Germany, and equal in value to $\frac{1}{30}$th of a thaler, worth 1¼d. or 2½ cents United States currency.

Grocyn, William, the first who publicly taught Greek at Oxford, was born at Colerne, Wilts, about 1446, and educated at Winchester and New College, Oxford. He pursued his studies afterwards in Italy, acquiring a knowledge of Greek from the Greek exile Chalkondylas; and settled again in 1491 at Oxford, where Sir Thomas More was among his pupils. When Erasmus visited Oxford he lived in Grocyn's house, and he speaks of him as his 'patronus et præceptor.' In 1506 he became master of Allhallows' College, near Maidstone, and here he died in 1519.

Grodek, a town of Austrian Galicia, 20 miles SSW. of Lemberg, in the centre of a flax-growing region. Pop. 10,742, nearly one-third Jews.

Grodno, a town of Russia, on the right bank of the Niemen, 148 miles by rail NE. of Warsaw. It has a medical academy and manufactures in cloth and tobacco. The new palace, erected by Augustus III. of Poland, is a handsome edifice. At first a Russian town, Grodno fell to Lithuania in 1241. Here Stephen Bathori died in 1586; here in 1793 the Polish diet ratified the second partition of Poland; and here, too, Stanislaus Augustus, the last king of Poland, abdicated (1795). Pop. (1895) 50,500. In the neighbourhood are the mineral springs of Drusskenik.—The province of Grodno (area, 14,931 sq. m.; population, 1,556,442) is an extensive plain, largely covered with pine forests, and in parts swampy. But it is crossed by the ridge that forms the watershed between the Baltic and Black Sea basins. Its largest rivers are the Bug, Narew, and Niemen. Rye, wheat, oats, potatoes, and tobacco are grown on the fertile soil. The province is a seat of the woollen industry. Trade (in timber, grain, flax, hemp, wool, &c.) is exclusively in the hands of Jews.

Grog, spirits and cold water, without sugar. The quaint name of *grog* is said to be derived from a nickname of Admiral Vernon, who in 1745 ordered his sailors to dilute their spirits with water. He was known to his men as 'Old Grog' from his wearing grogram breeches.

Groining. See Gothic Architecture.

Grolier, Jean, a famous French bibliophile, was born in 1479 at Lyons. He was attached to the court of Francis I., went to Italy as intendant-general of the army, and was long employed in diplomacy at Milan and at Rome. After his return to France he became *Trésorier général*, and died at Paris in October 1565. It is his library that has made Grolier famous. He acquired choice copies of the best works then existing, and had them magnificently and tastefully bound, with the generous inscription, *Io. Grolierii et Amicorum.* He had no less than 3000 books, and of these about 350 have come to light, bound elegantly in brown calf, both sides ornamented with floral arabesques. The library was dispersed in 1675, and Groliers are now precious prizes to the bibliophile, their prices at auctions varying from 600 to 1200 francs. See

the study by Le Roux de Liney (1866), and Clément de Ris, *Les Amateurs d'Autrefois* (1876).

Groningen (ancient *Cruoninga*), the north-eastern province of Holland, bounded N. by the North Sea and E. by Hanover, with an area of 887 sq. m. The surface lies low; the soil is fertile, particularly in the north; in the south-east there are several marshes, though they are being rapidly drained and cultivated (as the Bourtanger). Farming and grazing are the chief pursuits of the people. Shipbuilding is extensively followed; much butter is exported, and some woollen hosiery, cloth, linen, paper, pottery, and potato-meal are manufactured. The people, 285,780 in 1894, are almost entirely of the Frisian race, and belong chiefly to the Reformed Church.

Groningen, the capital of the above province, 25 miles by rail SW. of Delfzihl, on Dollart Bay, and 34 E. of Leeuwarden. The university, founded in 1614, with new buildings of 1850, and some 360 students, possesses a library, a botanic garden, an observatory, a collection of Teutonic antiquities, a hospital, and a museum of natural history. A celebrated deaf and dumb institution was founded by Guyot in 1790. The chief industries are the manufacture of linen and woollen goods, tobacco, brushes, Dutch tiles, and boat-building. Groningen, already an important place in the 9th century, joined the Hanseatic League in 1282. From the 11th century it fought hard to maintain its independence against the bishops of Utrecht, nor did it submit until 1493, and then only to escape being handed over by the emperor to the Duke of Saxony. During the 16th century it had a very stormy history, being finally won for the United Netherlands by Maurice of Nassau in 1594. Pop. (1876) 40,165; (1893) 57,967.

Gronovius, the Latinised form of Gronov, the name of a family of scholars of German extraction, settled in Holland, the principal members of which were: John Frederic Gronovius, born at Hamburg in 1611, studied at Leipzig, Jena, and Altdorf, became in 1643 professor at Deventer, and in 1658 at Leyden, where he died in 1671. He edited Livy, Statius, Tacitus, Phædrus, Seneca, Sallust, Pliny, and Plautus, and published many works showing a profound knowledge of Roman antiquities, among them his *Observationes et Commentarius de Sestertiis.*—James Gronovius, son of the preceding, born at Deventer in 1645, studied partly there and partly at Leyden, occupied for two years a chair at Pisa, was appointed in 1679 to his father's chair, which he held till his death in 1716. His works were his *Thesaurus Antiquitatum Græcorum* (15 vols. 1697–1702), and editions of Polybius, Herodotus, Cicero, and Ammianus Marcellinus.—Abraham Gronovius, son of the preceding, born at Leyden in 1694, became librarian to the university, and died there in 1775. He showed himself worthy of the traditions of his house by his excellent editions of Justinus Pomponius Mela and Tacitus.—John Frederick, an eminent botanist, brother of the preceding, was born at Leyden in 1690, and died there in 1760. His works were *Flora Virginica* (1743) and *Flora Orientalis* (1765).—Laurence Theodore Gronovius, son of the preceding, born 1730, died at Leyden, 1778, author of *Museum ichthyologicum* (1754–56); *Zoophylacium Gronovianum* (1763–81); and *Bibliotheca regni animalis* (1760).

Groot, Gerhard (1340–84), founder of the 'Brethren of the Common Life.' See Brotherhoods.

Groote Eylandt (Dutch, 'great island'), an uninhabited island on the west side of the Gulf of Carpentaria, in North Australia. It is surrounded by reefs, and its interior is hilly. In extreme length and breadth it measures about 40 miles each way.

Gros, Antoine Jean, Baron, a French historical painter, was born at Paris on 16th March 1771, studied in the school of David, and first acquired celebrity by his picture of 'Bonaparte on the Bridge of Arcole.' His first great achievement, however, was 'Napoleon visiting the Plague-smitten at Jaffa' in 1804; and scarcely less successful were the 'Battle of Aboukir' (1806) and the 'Battle of Eylau' (1808). Gros also painted several other historical pictures illustrating the achievements of Napoleon; the 'Meeting of Charles V. and Francis I.' in 1812; in 1811–24 an immense work for the cupola of the church of Saint Geneviève; the 'Departure of Louis XVIII. for Ghent' (1815); and the 'Embarkation of the Duchess of Angoulême' (1815). In his later years he returned to the traditionary classic style of painting, and in chagrin at his want of success is believed to have committed suicide. At all events, his body was drawn out of the Seine near Meudon, 27th June 1835. Gros's paintings are marked by powerful expression and dramatic movement, but are deficient in delicacy and sentiment. See his Life by Delestre (1867) and Tripier le Franc (1878).

Grosbeak, a name applied to not a few highly-specialised finches (Fringillidæ), with thick, heavy, seed-crushing bills, 'so high that their upper contours almost form one continuous curve with that of the head.' The European Hawfinch (q.v.) (*Coccothraustes vulgaris*) and the American Evening Grosbeak (*Hesperiphona vespertina*) are good examples. But the name is applied to many other birds—e.g. to the Cardinal Grosbeaks (Cardinalis) and the Rose-breasted Grosbeak (*Habia ludoviciana*).

Groschen. See Groat.

Grose, Francis, a famous English antiquary, born at Greenford, Middlesex, in 1731, son of a rich Swiss jeweller settled in England. In the College of Heralds in 1755–63, he next became adjutant of the Hampshire and then of the Surrey militia, and, when his easy habits had brought him to the end of his fortune, began to put to profit the favourite studies of his youth and his excellent draughtmanship. His *Antiquities of England and Wales* (6 vols. 1773–87) proved a success, and in 1789 he set out on an antiquarian tour through Scotland. His splendid social qualities, his rich humour and good nature, which fitted well with his Falstaff-like bulk, made him friends everywhere. Burns made his acquaintance, and has hit him off admirably in his poem, 'Hear, Land o' Cakes, and brither Scots.' The lines 'a chield's among you takin' notes, and faith he'll prent it,' are often quoted by persons ignorant of their original application. Grose crossed over to Ireland to continue the same inquiries, but died suddenly in an apoplectic fit at Dublin, 12th May 1791. Grose's work on the antiquities of Scotland appeared 1789–91; that of Ireland in 1791. Works of exceptional value are *A Classical Dictionary of the Vulgar Tongue* (1785; new ed. with Memoir by Pierce Egan, 1823), and *A Provincial Glossary* (1787). Other works are his *Treatise on Ancient Armour and Weapons* (1785–89); *Military Antiquities* (1786–88); *The Grumbler* (1791), a collection of amusing essays; and *The Olio* (1793), a strange hotch-potch of jests, verse, and prose essays.

Gross, Samuel David, American surgeon, was born near Easton, Pennsylvania, 8th July 1805, graduated at Jefferson Medical College, in Philadelphia, in 1828, and in 1835 became professor of Pathological Anatomy at Cincinnati. He was afterwards professor of Surgery in the universities

of Louisville and New York, and from 1856 to 1882 in Jefferson College. He died in Philadelphia, 6th May 1884. His published works are numerous and valuable, and include a *System of Surgery* (2 vols. 1859, 6th ed. 1882). Dr Gross was a member of many medical and surgical societies, both in America and in Europe, was president of the International Medical Congress at Philadelphia in 1876, and received the degree of D.C.L. from Oxford in 1872, and of LL.D. from Edinburgh in 1884.

Grossenhain, a busy town of Saxony, 21 miles by rail NNW. of Dresden. It has manufactures of cloth, buckskin, hosiery, nets, machinery, and cigars. Pop. (1875) 10,686; (1890) 11,938.

Grosseteste, Robert, Bishop of Lincoln, was born about 1175 at Stradbroke in Suffolk, of peasant parentage. *Grosseteste*, the French for 'great head;' Lat. *capito*) being a mere 'to-name.' Educated at Lincoln, Oxford, and Paris, he had for some years been the first teacher of theology in the Franciscan school at Oxford, and had held eight archdeaconries and other preferments, when in 1235 he was elected Bishop of Lincoln. He forthwith undertook in the most vigorous fashion the reformation of abuses, embroiling himself thereby first with his own chapter and next with Pope Innocent IV., whom he twice visited at Lyons, in 1244–46 and 1249–50. The pope granted English benefices to 'rascal Romans,' who drew indeed the revenues of their office, but never perhaps showed face in the country. This was intolerable to a man like Grosseteste, and he set himself strongly against it, incurring by his boldness a temporary suspension from the exercise of his episcopal functions, and a continual menace of excommunication. In the last year of Grosseteste's life, Innocent wrote to him ordering his nephew, a young Italian, to be promoted to the first canonry that should fall vacant at Lincoln, and accompanying his injunction with threats. The bishop was filled with indignation, and at once wrote a letter declaring that he would not obey such precepts even though they should issue from 'the highest order of angels,' and likening the pope's nepotism to the sin of Lucifer and Antichrist. Innocent, transported with fury, excommunicated him; but Grosseteste quietly appealed to Christ's own throne, and troubled himself no more about the matter. The feeling of the English nation sustained him; his clergy went on obeying him as if nothing had happened; and on his death at Buckden, near Huntingdon, 9th October 1253, Archbishop Boniface himself officiated at his funeral in Lincoln Cathedral. Such is the current account, against which Lingard objects that the mandate came not from the pope but the nuncio; that Innocent, on receiving Grosseteste's reply, not only rescinded the order, but adopted measures for the reform of these abuses; and that the story of Grosseteste's dying under sentence of excommunication rests on very questionable authority.

Grosseteste often is claimed as a pre-Reformation reformer; but his reforms were in the direction not of doctrine, but discipline. In politics he was a constitutionalist, a friend of Simon de Montfort. His learning was prodigious; Latin, Greek, Hebrew, French, mathematics, medicine, astronomy, mechanics, and music were among his attainments; whilst his knowledge of the Scriptures was profound. Pegge's catalogue of his works, of which only a few have been published, fills 25 closely-printed quarto pages, and exhibits 'treatises on sound, motion, heat, colour, form, angles, atmospheric pressure, poison, the rainbow, comets, light, as well as on the astrolabe, necromancy, and witchcraft.' See Brewer's *Monumenta Franciscana* (1858); Luard's edition of Grosseteste's Latin letters (Record Soc., 1862); and Perry's *Life and Times of Grosseteste* (S.P.C.K., 1871).

Grosseto, a little Tuscan town on the Ombrone, near its mouth, 160 miles SE. of Leghorn by rail, with a fine cathedral and old fortifications. Pop. 3962. Much marsh land in the Maremma has been drained and rendered healthy and fertile.

Grossglockner, the highest peak, 13,458 feet, of the eastern Alps and the centre of the range Hohe Tauern, is situated near the meeting-point of the frontiers of Tyrol, Carinthia, and Salzburg.

Grossulariaceæ, or Ribesiaceæ, a sub-order of Saxifragaceæ, including about 100 species, mostly all palæarctic or nearctic. See Currant and Gooseberry.

Grosswardein (Magyar *Nagy-Varad*), one of the oldest towns of Hungary, in the county of Bihar, is situated in a beautiful plain, on the Sebes (Rapid) Körös, 152 miles by rail SSE. of Pesth. Formerly a fortress, it is now the seat of a Roman Catholic and of a Greek bishop, has nineteen churches, and manufactures spirits, oil, vinegar, tiles, matches, pottery, and wine. Pop. (1870) 28,698; (1891) 38,219. In the neighbourhood is the Bishop's Bath, with alkaline sulphur-springs (104°–106° F.). At Grosswardein peace was concluded between Ferdinand I. of Austria and John Zapolya of Transylvania in 1538. It was taken and pillaged by the Turks in 1660, and remained in their hands until its recapture by the Austrians in 1692.

Grote, George, historian and politician, was born at Clay Hill, Beckenham, Kent, November 17, 1794. He was educated at the Charterhouse, and in 1810 became a clerk in the bank founded by his grandfather (a native of Bremen), Mr George Prescott, in Threadneedle Street. He remained in the bank for thirty-two years, devoting all his leisure to literature and political studies. He was an advanced Liberal in politics, and his first literary production was a reply to an article by Sir James Mackintosh in *The Edinburgh Review* on parliamentary reform. This was succeeded by a small work on *The Essentials of Parliamentary Reform*. Becoming acquainted with James Mill, Grote ultimately accepted his views on democratic government and church establishments; and many years before the passing of the Reform Bill of 1832 he laboured with a band of other ardent reformers in promulgating the views of Mill and Bentham and opposing both the Whigs and Tories. He further studied James Mill's system of political economy, and was not a little influenced in philosophy by the views of Comte. In 1820 he married Harriet, daughter of Thomas Lewin, of Bexley, a lady of considerable literary gifts, and their house in Threadneedle Street became a distinguished centre of political and philosophical thought. Encouraged by his friends the two Mills, John Austin, and Charles Buller, and strongly urged also by his wife, he conceived in 1823 the idea for his *History of Greece*. Mitford's history he mercilessly dissected at this time in the *Westminster Review*. Grote became head of the bank in 1830, and his position in the city, combined with his well-known talents, naturally pointed him out as a fitting representative of the Metropolis in parliament. In the election of 1832, consequent upon the passing of the Reform Bill, he stood for the City, and was returned at the head of the poll. During his first session in parliament he brought forward a motion for the adoption of the vote by ballot, his speech being remarkably able and incisive. The motion was lost by 211 to 106 votes, but Grote renewed it in the following session, and continued to advocate the measure until his abandonment of parlia-

mentary life in 1841. He sat for the City of London in three successive parliaments, but on each occasion by a diminished majority; and when he relinquished his seat the party of Philosophical Radicals with which he was associated had lost much of its influence.

Grote retired from the banking-house in 1843, and now devoted himself exclusively to literature, the *History of Greece* becoming the main object of his life. The first two volumes of the work appeared in 1846, and met with the general favour of all parties. The twelfth volume was issued in 1856, bringing down the subject to the end of the generation contemporary with Alexander, the period originally designed by the author. The history was translated into German and French, and was confessedly deserving of the high position to which it attained in literature. While it throws new light upon Greek history, and lucidly traces the progress of Hellenic thought, its martial passages are notable for their vigour, and its geographical details for their accuracy. Grote was appointed a trustee of the British Museum, and in 1864 foreign associate of the French Academy. He was elected president of University College, and vice-chancellor of London University, which offices he held until his death. In the latter capacity he rendered signal services to the university. In 1865 he concluded an elaborate work on *Plato and the other Companions of Socrates*, which, with his *Aristotle*, was supplementary to the *History of Greece*. The latter work, notwithstanding its lack of imagination, still remains unsuperseded for its graver qualities and for its completeness as an historical picture. In dealing with Plato he was less successful, failing to grasp the lofty idealism of the Greek philosopher; and his study of Aristotle, which gave promise of a closer appreciation, unfortunately remains unfinished. A sketch of Swiss history during the war of the Sonderbund possesses special interest from its comparisons between the small republics of Switzerland and the city states of ancient Hellas. Grote, who declined a peerage offered him by Mr Gladstone, died June 18, 1871, and was buried in Westminster Abbey, where a bust by Bacon commemorates him. His minor works were published by Professor Bain in 1873, with critical remarks on his intellectual character, writings, and speeches; and *Fragments on Ethical Subjects*, being a selection from his posthumous papers, in 1876. Mrs Grote (1792–1878) was the authoress of a *Memoir of Ary Scheffer* (1860), *Collected Papers in Prose and Verse* (1862), and *The Personal Life of George Grote* (1873). See, too, *Mrs Grote: a Sketch*, by Lady Eastlake (1880).

Grotefend, Georg Friedrich, the first who found a key to the decipherment of the cuneiform inscriptions, was born at Münden in Hanover, June 9, 1775, and had his education at the university of Göttingen. He filled scholastic appointments at Göttingen, Frankfort-on-the-Main, and Hanover, and died 15th December 1853. He wrote learned books and papers on Latin, Umbrian, and Oscan philology, coins of Bactria, &c., but made for himself an enduring fame by deciphering the cuneiform alphabet—an intuition of genius—first given forth in 1802. Later works on this subject were *Neue Beiträge zur Erläuterung der Persepolitanischen Keilschrift* (1837), and *Neue Beiträge zur Erläuterung der Babylonischen Keilschrift* (1840). See Cuneiform Inscriptions. His son, Karl Ludwig Grotefend, an eminent antiquary and historian, was born at Frankfort-on-the-Main, 22d December 1809, studied at Göttingen University, and filled from 1853 a post in the Royal Archives at Hanover. He died 27th October 1874. His works are of the greatest value for numismatics and Roman epigraphy, the chief being *Die Münzen der Griechischen, Parthischen, und Indoskythischen Könige von Baktrien* (1839), *Imperium Romanum tributim Descriptum* (1863), and *Chronologische Anordnung der Athenischen Silbermünzen* (1872). His historical papers are mostly contained in the *Zeitschrift des historischen Vereins für Niedersachsen* (1850–74).—Friedrich August Grotefend, nephew of the great Grotefend, was born at Ilfeld, 12th December 1798, studied at Göttingen University, and afterwards became a professor there. He died 28th February 1836. His writings are mostly solid contributions to Latin philology.

Grotesque, a style of classical ornament, so called, in the 13th century, from its having been discovered amongst the painted decorations found in the excavations made in the baths of Titus and other ancient Roman buildings, the Italian word *grotto* applying to any subterranean chamber. This light, fantastic style was much in favour during the Renaissance.

Groth, Klaus, a modern writer of Low German, was born at Heide in Holstein, 24th April 1819. After teaching for some time in his native village, he spent six years (1847–53) of literary activity in the island of Femern. It was at this time that he composed his masterpiece, *Quickborn* (1852, 15th ed. 1885), a collection of poems written in the Ditmarsh dialect, and dealing with life and nature in Ditmarsh, poems as fresh and simple as the subjects that inspired them. A continuation was published in 1871. Both in *Quickborn* and in the prose village tales *Vertelln* (1855–59) Groth used Low German with great skill and ease, and with a fine feeling for its artistic capabilities. His other works in the same dialect are *Rothgeter, Meister Lampun sin Dochder* (1862), an idyll; *Voer de Goern* (1858), children's rhymes; *Ut min Jungsparadies* (1876), three stories; and *Drei Plattdeutsche Erzählungen* (1881). He has also written poems in High German, *Hundert Blatter* (1854), which are not adjudged so successful as his Low German efforts. A warm lover of his native tongue, he claims for it a co-ordinate place with High German in the polity of languages, and has urged his views in *Briefe über Hochdeutsch und Plattdeutsch* (1858) and in *Mundarten und Mundartige Dichtung* (1873). After five years' wandering in Germany and Switzerland, Groth began to teach German language and literature at Kiel in 1858, and in 1866 was nominated professor of the same subjects at the university there. See Eggers, *Klaus Groth und die plattdeutsche Dichtung* (1885).

Grotius, Hugo, or Huig van Groot, Dutch jurist, was born at Delft, 10th April 1583. An extraordinarily precocious boy, Grotius entered the university of Leyden in his eleventh year, and there he enjoyed the advantage of studying under Joseph Scaliger. When only fifteen years old he entered public life, accompanying Olden Barneveldt, the grand-pensionary, on an embassy to France, where, notwithstanding his extreme youth, his talents and conduct gained him the favour of Henry IV. On his return next year he began to practise as a lawyer in the Hague; in 1607 he was appointed a provincial fiscal-general, and in 1613 pensionary of Rotterdam. But the religious disputes between the Remonstrants and their opponents were now at their height in Holland; Olden Barneveldt was the protector of the former, and Grotius supported them by his writings and influence. These theological strifes had, however, a political significance also. In 1618 Barneveldt and Grotius were arrested, tried, and condemned by the dominant party under Prince Maurice (see Barneveldt), Barneveldt to death, and Grotius to imprisonment for life in the castle of Lovenstein. He escaped, however, by the contrivance of his

wife, who managed to have him carried out of the castle in a chest used for the conveyance of books and linen, while she remained in prison in his stead. Grotius found refuge at Paris in 1621, and Louis XIII. bestowed upon him a pension of 3000 livres. But ten years later this pension was withdrawn from him. From his youth upwards Grotius had been a diligent student of jurisprudence; in 1604 he wrote a work entitled *De Jure Prædæ*, which, however, he did not publish, but which he seems to have steadily improved year after year, until finally he issued it as his masterpiece, *De Jure Belli et Pacis*, in 1625. This work, a piece of most excellent scholarship, at once established its place as a standard authority on international law, and such it remained for several generations (see INTERNATIONAL LAW). In 1634 Oxenstierna and Queen Christina induced Grotius to enter the Swedish service as ambassador at the French court, a post which he held until 1645. On his retirement he proceeded to Stockholm; but, finding the court as uncongenial as the climate, he was returning home to Holland when he was shipwrecked, and died at Rostock, on the 29th August 1645.

To the talents of an able statesman Grotius united deep and extensive learning. He was a profound theologian, perhaps the best exegete of his day—a distinguished scholar, an acute philosopher, a judicious historian, and a splendid jurist. He was one of the best modern writers of Latin verse, and likewise composed poems in the Dutch language. His best historical work is *Annales et Historiæ de Rebus Belgicis* (1657), written in a style that recalls Tacitus by its concise and pointed power. His theological productions bear the titles *Annotationes in Libros Testamentum* (1644); *Annotationes in Novum Testamentum* (1641–46); and *De Veritate Religionis Christianæ* (1627), translated even into several oriental languages, and remarkable for its clear arrangement, vigorous logic, and graceful style. It is an elegant treatise on Christian apologetics. Lehmann's *Hugonis Grotii Manes Vindicati* (1727) contains a good life and a complete bibliography of his works. See also Hely, *Etude sur le Droit de la Guerre et de la Paix de Grotius* (1875), and Butler's *Life* (1827). The *De Jure Belli* was translated into English by Whewell in 1853.

Grotta del Cane ('Grotto of the Dog'), a small cave near Naples, in the vicinity of Lake Agnano and of Puzzuoli, contains carbonic acid gas with 77 per cent. of carbonic acid. This cave was known to the ancients, and is described by Pliny. It derives its name from the practice of introducing into it small dogs, which are soon almost deprived of life by the gas that owing to its density clings to the floor of the cave; but they soon recover upon being restored to the open air.

Grottaglie, a town in the Italian province of Lecce, 12 miles ENE. of Taranto, with 8880 inhabitants, who carry on wine-growing, bee-keeping, and silk and cotton weaving.

Grotte, LE, a town of Sicily, in the province of Girgenti. Pop. 8775, mostly employed in the sulphur-works of the district.

Grouchy, EMMANUEL, MARQUIS DE, French general, born at Paris, 23d October 1766. Entering the army at fourteen, he threw in his lot with the Revolution, and had his first taste of serious work in helping to suppress the Vendean revolt. After being nominated second to Hoche for the abortive expedition to Ireland, though Grouchy did enter Bantry Bay, he proceeded to join Joubert in Italy in 1798. Under Moreau, he greatly distinguished himself in Piedmont, and at Novi was taken prisoner, but subsequently exchanged (1799). Later he fought with conspicuous gallantry at Hohenlinden, Eylau, Friedland, Wagram, and in the Russian campaign of 1812, being appointed during the memorable retreat leader of the 'sacred' bodyguard of Napoleon. After the disastrous battle of Leipzig, Grouchy covered the retreat of the French on the west side of the Rhine. Amongst the first to welcome Napoleon after his escape from Elba, Grouchy destroyed the Bourbon opposition in the south of France, and then, hastening north, routed Blucher at Ligny. After the defeat at Waterloo and the second abdication of Napoleon, Grouchy, appointed by the provisional government commander-in-chief of the broken armies of France, led them skilfully back towards the capital; then, resigning, he betook himself to the United States. He returned from exile in 1819, and was reinstated as marshal in 1831. His death occurred at St-Etienne on 29th May 1847. See his *Memoires*, edited by his grandson (5 vols. 1873–74).

Ground-annual, in the law of Scotland, is an annual payment, sometimes called a rent-charge, made for land. It may be regarded as a substitute for feu-duty, and is little known where the law allows the constitution of a feu-duty. Thus, when a vendor sells his land, and instead of taking a lump sum for the price, prefers a sum by way of a perpetual annuity or rent, he conveys the land in fee to the disponee or purchaser, subject to this ground-annual, which is a burden on the lands transferable and extinguishable like other real burdens. The vendor is then called the ground-annualer, and if the ground annual is not paid he is entitled as a remedy to poind the ground—i.e. seize all the goods, whether of the owner or his tenants, which are found on the lands, and pay himself, and raise action of maills and duties against the tenant, or he may sue the debtor.

Ground-game. See GAME LAWS.

Ground-ice. See ANCHOR ICE.

Ground-ivy (*Glechoma hederacea*, united with the genus Nepeta by some botanists as *N. Glechoma*), a plant of the natural order Labiatæ, a common native of Britain and other parts of Europe, growing in waste places, plantations, hedges, &c., in a dry soil. It has a creeping stem, kidney-shaped crenate leaves, and axillary blue flowers growing in threes. A tea prepared from the leaves is in great repute among the poor in many places, and the plant is supposed to be stimulant, aromatic, and of use in pectoral complaints. The leaves were formerly used in England for clarifying and flavouring ale, which was then called Gill-ale or Gell-ale, from Gill or Gell, an old name of this plant; but this use has been discontinued since the introduction of hops.

Groundling (*Cobitis tænia*), the spinous loach, a little cyprinoid fish resembling the loach, from which it is distinguished by a forked erectile spine beneath the eye, and by its more compressed form. It is rare and very local in Britain, frequenting the muddy parts of rivers, habitually keeping close to the bottom. The genus is known to include only two other species.

Ground-nut, GROUND BEAN, or PEA NUT, the fruit of *Arachis hypogæa*, an annual plant belonging to the natural order Leguminosæ, extensively cultivated in southern North America, but supposed to be a native of Africa. The name *Arachis*, *Aracos*, or *Aracidna*, was given by Pliny to a plant which was stemless and leafless, being all root. Modern botanists have given the name to a species which ripens its fruit underground. The pods, though first formed in the air, are as they increase in size forced into the earth by a natural

motion of their stalks, and there come to maturity 3 or 4 inches under the surface, hence the popular name Ground or Earth-nut. In the southern states of North America the seeds, or nuts, as they are called, are roasted and used as chocolate. When fresh they have a sweet taste resembling almonds. They are a favourite article of food with the negroes. A fixed very sweet oil is extracted from the seeds, which is considered by some equal to olive-oil, and it does not become rancid, rather improving with age. Ground-nuts are to be met with occasionally in fruiterers' shops in Britain, and some attempt has been made to cultivate the plant around Paris; but requiring as it does to be reared in hot-beds, expense and trouble have circumscribed its adoption as a commercial production there. It is, however, cultivated in some of the warmer countries of the south of Europe.—The roots of *Bunium bulbocastanum* and *B. flexuosum* are also known as ground-nuts or Earth-nuts (q.v.).

Ground-nut (*Arachis hypogæa*).

Ground Pigeon, a name widely applied to those numerous pigeons (Columbidæ) which are terrestrial rather than arboreal. The more thoroughly ground-loving forms have short and rounded wings, and lessened power of prolonged flight, but possess long legs and a rapid pace. See Elliot, *Standard Natural History*, vol. iv. Boston, 1885), for an admirable account.

Ground-rent, in the law of England, is the rent which a person, who intends to build upon a piece of ground, pays to the landlord for the use of the ground for a certain specified term, usually ninety-nine years. The builder usually pays a certain annual sum by way of rent to the owner, who is thereafter called the ground-landlord, and then commences to build upon the land. The builder then lets the houses, and in doing so he of course includes in the rent which he puts upon each house a proportionate part of this ground-rent, which he himself is bound to pay to the ground-landlord, so that practically the tenant pays both the rent and the ground-rent, the latter being so called because it issues out of the ground, independently of what is built upon it. Ground-rents often form a safe investment for capital, because the security is good. This security consists in the ground-landlord being able, whenever his ground-rent is in arrear, to distrain all the goods and chattels he finds on the premises, to whomsoever they may belong; and as the ground-rent is generally a small sum, compared with the furniture of the tenant, he is always sure to recover its full amount. This power of distress exists (except in the case of lodgers) whether the tenant has paid his rent to his own landlord or not; but if at any time the tenant has been obliged to pay the ground-rent which his landlord ought to pay, he may deduct such sum from the next rent he pays, and set off the one against the other so far as it will go. At the end of the ninety-nine years, or whatever other term is fixed upon, the building becomes the property of the ground-landlord, for the interest of the builder (or mesne landlord as he is called) then expires by the effluxion of time. The value of the property thus reverting to the ground-landlord is often greatly increased by municipal improvements effected at the expense of the rates—i.e. at the expense of the occupier who pays the rates. The justice of this arrangement is open to question, and the case for a readjustment of rates is generally admitted to be a strong one. There are some politicians who announce that they will accept this reform as a mere instalment; their ultimate aim is to 'nationalise' the land by taxing ground-rents at the rate of twenty shillings in the pound.

Ground-rent corresponds to *feu* in Scotland, with this difference, that the feu-rent in the latter case lasts for ever, there being no definite term fixed for its ceasing.

Groundsel, the common name of those species of Senecio (q.v.) which have small heads of flowers either destitute of ray or with the ray rolled back. The Common Groundsel (*S. vulgaris*), which is usually destitute of ray, is one of the most plentiful of weeds in waste and cultivated grounds in Britain and most parts of Europe, and now also diffused, through European commerce and colonisation, throughout the world. It is a coarse-looking annual, of rapid growth, about a foot high, branched, with pinnatifid leaves, and small yellow heads of flowers; flowering at all seasons, even in winter, when the weather is mild; its seeds being also widely diffused by means of their hairy pappus. It has a rather disagreeable smell; but birds are very fond of the young buds and leaves, and cage-birds are fed with them. It is also eaten by cattle if better fodder be scarce. It has a saltish taste, whence its name; and is of old repute in domestic medicine for poulticing. The other British species are weeds of very similar appearance, but are stronger, having a more disagreeable odour, and are viscid to the touch. Groundsel has been introduced into the United States, and is now found as a weed in gardens and waste places from New England to Pennsylvania.—Like other annual weeds, the groundsels ought to be hoed down or pulled as they appear, when the ground is in crop.

Ground Squirrel. See CHIPMUNK.

Grouse, a name applied to many game-birds in the family Tetraonidæ, which also includes quails and partridges. From these the grouse (forming a sub-family Tetraoninæ) may be distinguished by the more or less complete feathering of nostrils, legs, and feet, by a bare patch of skin over the eye, by a comb-like fringe on the sides of the toes, and sometimes by a distensible sac on the side of the neck. They are well known to be large, plump, somewhat heavy birds, usually short-tailed, and with beautifully-variegated plumage, which must often be protective. They are especially abundant in the northern parts of both Old and New World.

We shall first take a brief review of most of the important forms, some of which receive separate notice. (1) The genus Tetrao is well represented by the Capercailzie (q.v.; *T. urogallus*), its Siberian relative *T. urogalloides*, and the Black-cock (q.v.) or Black Grouse (*T. tetrix*), well known in Britain. (2) The Ptarmigans (q.v.) belong to the genus Lagopus, distinguished by their heavily-feathered toes, and (with the exception of the next species) by the snow-white winter plumage. The Red Grouse (*L. scoticus*) is indigenous only to

Britain, represented by the Willow Grouse (*L. albus*) in other northern countries. (3) The ruffed grouse, in the genus Bonasia, are exceptional in having the lower part of the leg bare, and can elevate the soft feathers on the sides of the neck. Well known is the American species *B. umbellus*, with several varieties. They frequent woods, roost in trees, nest on the ground, and fly straight and swiftly. The male is famous for his habit of 'drumming.' 'He stands upon a trunk of some fallen tree, and, stretching himself into a horizontal position, beats stiffly downwards with his wings, slowly at first, increasing the strokes until they become so rapid that the wings are invisible. This loud drumming noise is heard even after the limits of the breeding season. An allied species, the Hazel Grouse (*B. betulina*), is widely distributed in Europe and Asia, but is without ruff or drumming. Along with two other species it is sometimes ranked in a separate genus, Tetrastes.

(4) Among the numerous North American grouse, besides species of Bonasia and Lagopus, there are first of all several forms nearly related to, if not included within the genus Tetrao. The 'Blue Grouse' (Dendragapus) inhabit evergreen forests at a high elevation; the males emit in spring a prolonged whirring sound from the contraction of two dilatable sacs on the neck. The flesh is white and delicate. The Spruce Grouse (Canace) are represented by several species—'forest- and swamp-loving birds, very tame and unsuspicious, with dark and generally bitter flesh.' Well known are the Prairie Hens or Prairie Chickens, of which *Cupidonia*, or sometimes *Tetrao cupido*, is the commonest, though in process of rapid extermination even in spite of the laws. It is rather smaller than a blackcock, reddish-brown in colour, with beautiful markings of black and white, and bears on the sides of the neck two large dilatable sacs, hidden by erectile feathers, and producing by their expansion and contraction loud 'booming' sounds, which, as well as the combats between rival males, enliven the breeding season. The flesh is much esteemed, and the bird is ruthlessly persecuted. Nearly related, but with less-developed neck sacs, is the sharp-tail grouse, referred to the genus Pediœcetes. The largest American grouse, however, is the Cock of the Plains or Sage Cock (*Centrocercus urophasianus*), the male of which approaches our capercailzie in size, though not by any means in weight. It is dispersed over the western plains, and, according to Elliot, owes the bitter unpalatable character of its flesh to its diet of Artemisia or 'wild sage' which abounds in these desert regions. The tail is remarkably long, the neck sacs very large, the usually hard gizzard portion of the stomach remains soft. As the Sand grouse (Pteroclidæ)—one of which, Pallas's Sand-grouse (*Syrrhaptes paradoxus*), has been coming in increasing numbers to Britain since 1859—are not grouse, if indeed even gallinaceous, they must be noticed separately.

Returning now to British grouse (Tetraonidæ), we have to deal with (1) the Capercailzie (*Tetrao urogallus*), (2) the Blackcock (*T. tetrix*), (3) the rare Ptarmigan (*Lagopus mutus*), and (4) the Red Grouse (*L. scoticus*). The first three are separately discussed; it remains to notice briefly the last, which is in a special sense the British grouse. This is strictly an insular ptarmigan which does not change its colour, and is very nearly related to the Willow Grouse (*L. albus*) of the Continent. It is widely distributed on the moors in the north of England, in Ireland, but above all in Scotland. The male measures 16 inches, and is predominantly reddish and chestnut-brown with some black and white. The female is rather smaller, and with more of the light chestnut plumage. The colour varies considerably in different localities. Pairing occurs in early spring; the nest is slight, and on the ground usually among heather; the eggs (eight to ten) are 'of a buffish white ground colour,

The Red Grouse (*Lagopus scoticus*).

mottled with rich red or brown.' The female sits very close, and the male gives warning of danger. The birds feed on leaves and fruit of bilberry, tips of heather, sedge seeds, and the like.

Grouse are well known to be subject to a decimating disease, but neither in regard to the direct or indirect conditions of the epidemic is there any certainty. It was first noticed (1815-20) about the time when shootings began to be let and protection or over-preservation became common. Atmospheric conditions, sheep, sheep-wash, heather-blight, &c. have been blamed, while John Colquhoun, author of *The Moor and the Loch*, strongly maintained that the indirect cause was simply over-preservation. The destruction of birds of prey, which used to kill off unhealthy birds, must certainly have its nemesis. Tapeworms are often found in grouse, but are not regarded as of much import; a round worm (Strongylus) is possibly more injurious; most probably, however, the disease is due to bacteria of some sort, and runs riot in unnatural conditions.

Grouse-shooting has long been a popular sport with those living where the birds abounded, but it was not till near the middle of the 19th century that Southrons began to flock into Scotland for this sport, and shooting rents to grow rapidly. In many districts the 12th of August is the most important date in the year. Many thousands of acres now bring their owners large rents for grouse-shooting; there are said to be in Scotland in all, besides deer-forests, some 2400 separate shootings, on most of which grouse are found. Grouse occur in every Scottish county, but Perthshire is the chief grouse-shooting region. An area of 10,000 acres well stocked with birds, and having a shooting lodge, can hardly be leased for less than £500 per annum (*Outdoor Sports in Scotland*, 1889); if there be salmon and ground-game, the rent may be £600. The rents may be said to run from tenpence to half-a-crown an acre. In a good season, 500,000 brace may be shot. It is computed that every brace costs the sporting tenant a sovereign. Hence if each of the 2400 grouse-moors yield each on an average 200 brace, the total (960,000 birds) would represent a grouse-shooting rental for Scotland of £480,000.

See Blackcock, Capercailzie, Ptarmigan, Sand-grouse; also D. G. Elliot, *The Tetraonidæ* (New York, 1864-65); also in *The Riverside or Standard Natural History*, edited by J. S. Kingsley (Lond. and Boston); A. B. Meyer, *Unsere Auer-, Birk- und Rackwild* (Vienna, 1887, folio atlas with 17 plates of grouse); R. W. Shufeldt, *Osteology of North American Tetraonidæ*, Bull,

U.S. Geol. Geogr. Surv. vi. (1881–); manuals of Yarrell, Howard Saunders, &c.; Colquhoun, *The Moor and the Loch* (1851, 6th ed. 1884); Lord Walsingham and Sir R. Payne-Gallwey, *Shooting* (Badminton Lib. 1886); 'Ellangowan,' *Outdoor Sports in Scotland* (1869). For disease, see *Zoologist*, *Rep. Brit. Assoc.*, and *Journ. Roy. Micr. Soc.*; Chapman, *Bird Life on the Borders* (1889); Klein, *Etiology and Pathology of Grouse Disease* (1892).

Grove, Sir George, born at Clapham in 1820, was trained as a civil engineer, and erected in the West Indies the first two cast-iron lighthouses built. As a member of the staff of Robert Stephenson, he was employed at the Chester general station and the Britannia tubular bridge. He was secretary to the Society of Arts from 1849 to 1852, and secretary to the Crystal Palace Company from 1852 to 1873, where he subsequently became a director. It is for his services to literature and music that Sir George is best known. As editor of *Macmillan's Magazine*, as a large contributor to Smith's *Dictionary of the Bible*, and as editor (and part author) of the great *Dictionary of Music and Musicians* (4 vols. 1878–89), he has served the reading public; and these and his zeal and success in promoting the love of good music secured for him the degree of D.C.L. from Durham University in 1872, and LL.D. of Glasgow in 1886. He was knighted in 1883 on the opening of the Royal College of Music, of which he was made Director—a post he resigned in 1895. He was founder of the Palestine Exploration Fund, published *Beethoven and his Nine Symphonies* in 1896, and was a contributor to this Encyclopædia. He died 29th May 1900.

Grove, Sir William Robert, lawyer and physicist, was born at Swansea, 11th July 1811. He studied at Brasenose, Oxford, and in 1835 was called to the bar; in 1871 he was raised to the bench, receiving knighthood in 1872; and by the Judicature Act (1875) becoming a judge in the High Court of Justice. He retired from the bench in 1887. He greatly distinguished himself in the subjects of electricity and optics, and was professor of Natural Science at the London Institution from 1840 to 1847. In 1839 he invented the powerful voltaic battery known by his name. He contributed extensively to scientific journals, and published several very important lectures, as those on the Progress of Physical Science (1842), in which he propounded the theory of the mutual convertibility of the natural forces, on the assumption of their all being modes of motion; the Correlation of the Physical Forces (1846), a development of the same views; Voltaic Ignition (1847); and the Continuity of Natural Phenomena (1866). He was president of the British Association in 1866, and was a Fellow of many learned societies. He died on the 3d August 1896.

Groves. See Ashera, Tree-worship.

Growler (*Grystes salmonoides*), a fish of the Perch family, abundant in many of the rivers of North America, as in the neighbourhood of New York. It attains a length of 2 feet, affords good sport to anglers, and is much esteemed for the table. It is of an olive colour, dark on the upper parts, and becoming grayish-white beneath. It receives its name from a sound which it emits. The genus Grystes has small scales, and only fine villiform teeth. Nearly allied is the genus Oligorus, including the valuable Murray Cod (*O. macquariensis*) from the Murray and other rivers of South Australia, which may attain a length of 3 feet and a weight of 100 lb., and a New Zealand coast form, the 'Hapuku' (*O. gigas*).

Groyne, The, a sailor's name for Coruña (q.v.).

Grub, a name generally applied to the worm-like larvæ of insects when they have a distinct head but no legs—e.g. in bees and some beetles. In distinction therefrom, a larva without distinct head and without limbs, as in Diptera, is a *maggot*, but with distinct head and limbs, anterior as well as posterior, is a *caterpillar*. But these are all somewhat rough and ill-defined titles, now replaced by a more exact terminology (see Insects and Larva). The economic importance of many grubs, especially those of some beetles, is well known. See Corn Insects.

Grubber, an agricultural implement consisting of a framework of cast or wrought iron, in which are fixed *tines* or teeth, somewhat like those of a harrow, but curved, and so placed as to enter the ground somewhat obliquely when the implement goes forward; the whole moving on wheels, by which the depth to which the teeth may penetrate is regulated.

Gruber, Johann Gottfried, German author, born at Naumburg on the Saale, 29th November 1774, studied at Leipzig, and in 1811 was appointed professor at the university of Wittenberg, and in 1815 professor of Philosophy at Halle. He died 7th August 1851. His chief work was that of editing, first with Ersch, and after his death alone, the first section (A to G) of the *Allgemeine Encyklopädie* (see Encyclopædia). Of his independent works we mention *Charakteristik Herders* (1805), *Geschichte des menschlichen Geschlechts* (1805), and lives of *Wieland* (1815–16) and *Klopstock* (1832); he also edited *Wieland's Sämmtliche Werke* (1818–28).

Grub Street, thus described in Dr Johnson's *Dictionary:* 'Originally the name of a street near Moorfields in London, much inhabited by writers of small histories, dictionaries, and temporary poems, whence any mean production is called *Grub-Street.*' Andrew Marvell used the name in its opprobrious sense, which later was freely used by Pope, Swift, and the rest. The name has been changed into Milton Street, from the neighbourhood of the Bunhill residence of the poet. One of the most entertaining of the old newspapers is the *Grub Street Journal*, which ended with its 418th number, December, 29, 1737, the principal writers of which are supposed to have been Dr Richard Russel and Dr John Martyn, and which was used, if not by Pope himself, at least by his party, as a vehicle for attacks against the Dunces.

Gruel is a mild, nutritious, easily-digested article of food. To prepare it, put a teacupful of oatmeal into a pint of water; after standing twenty minutes pour off the water, rejecting the coarse parts of the meal; boil the water twenty minutes. It may be flavoured according to taste; butter should not be added if the gruel is meant for invalids. Gruel is more nourishing than preparations from arrowroot, sago, tapioca, and other starchy substances.

Grün, Anastasius. See Auersperg.

Grünberg, a town of Prussian Silesia, 34 miles NW. of Glogau by rail, is surrounded by vine-clad hills, and manufactures wine (since 1150), woollen goods, twine, machinery, &c. Pop. 14,396.

Grundtvig, Nikolai Frederik Severin, Danish poet and theologian, was born at Udby, in Zealand, 8th September 1783. He first became known as the author of *Northern Mythology* (1808; 3d ed. enlarged and revised, 1870) and *Decline of the Heroic Age in the North* (1809). These were followed in 1814 by the *Rhyme of Roeskilde* and the *Roeskilde Saga*, and in 1815 by a collection of patriotic songs (*Kvadlinger*). About the same time he took his stand as a witness against the current irreligion and rationalism. As time went on he became the head of a religious school, the Grundtvigians, who strove to free the church from the interference of the state, and to approximate to

the ideal of independent religious communes. His religious views got firm hold of the hearts of the people throughout the three countries of Scandinavia. Besides this he was instrumental in raising the educational condition of the peasantry. In 1825 Grundtvig, for a vehement attack upon one of the chief representatives of the prevalent rationalism, was fined and suspended from preaching, the suspension lasting until 1832. During all these years his pen was never idle. In 1818 he had begun the translation into Danish of Snorri Sturluson and Saxo Grammaticus; and in 1820 he published a Danish translation of the Anglo-Saxon poem *Beowulf*. As a writer of secular and sacred poetry he stands high in his countrymen's regards; his son published his *Poetiske Skrifter* (6 vols.) in 1880-85. From 1839 Grundtvig preached in the church of Vartov Hospital in Copenhagen, after 1861 with the title of bishop, though he held no see. He died 2d September 1872. The works of his later years include *The Seven Stars of Christendom* (1860; 3d ed. 1883) and *Church Mirror* (1871), a collection of addresses. His son, SVEND HELGE (1824-83), from 1869 professor of Scandinavian Philology at Copenhagen, edited *Danmarks Gamle Folkeviser* (1853-83), other collections of folk tales, and *Sæmund's Edda* (1868; 2d ed. 1884).

Grundy, Mrs, the invisible *censor morum* appealed to in the phrase, 'But what will Mrs Grundy say?' in Morton's play *Speed the Plough* (1800).

Grundy, SYDNEY, born in Manchester 23d March 1848, was called to the bar. In 1876 he published a 3-volume novel, *The Days of his Vanity*; but has since become known as a successful playwright, having produced *The Glass of Fashion* (1883), *A Fool's Paradise* (1890), *A White Lie* (1893), *Sowing the Wind* (1893), and *The New Woman* (1894). Many (like *A Pair of Spectacles*) are adaptations from the French.

Gruyère, a little town of Switzerland, 16 miles SSW. of Freiburg, gives its name to the famous cheese of the whole canton of Freiburg. Pop. 1200.

Gryllus, a Linnean genus of insects of the order Orthoptera, answering to the section Saltatoria (Lat., 'leapers') of later entomologists, and containing crickets, grasshoppers, locusts, &c. The genus is now restricted to the true crickets—e.g. *G. domesticus* and *G. campestris*, while the family Gryllidæ is defined to include a not very large number of related genera, such as the mole cricket (Gryllotalpa). See CRICKET, GRASSHOPPER, LOCUST.

Gryphius, SEBASTIAN, a famous printer, born at Reutlingen, in Swabia, in 1493. He came as a youth to Lyons, and died there in 1556, having between 1528 and 1547 issued above 300 works, notable for their accuracy and the large clear type in which they were printed. Gryphius preferred a large bold Italic type. Amongst the more noted works are the fine Latin Bible of 1550, and Dolet's *Commentaria Linguæ Latinæ* (1536). The original German spelling of the Latinised name Gryphius is *Gryph*, the French *Gryphe*. The well-known emblem on Gryphius's publications is a griffin. Gryphius's sons, Antoine and François, were also famous French printers.

Gsell-Fels, THEODOR, author of the excellent guide-books for Italy, was born at St Gall in 1819, and has laboured with equal success as a medical man in various towns (Würzburg, Berlin, Vienna, Zurich, &c.) and as a lecturer on Italian art (chiefly at Basel). His thorough knowledge of Italy, its history and its art treasures, is brilliantly illustrated in his four guide-books to that country—'Oberitalien,' 'Mittelitalien,' 'Rom und die Campagna,' 'Unteritalien und Sizilien'—which are published as *Meyer's Reisebücher*. Gsell-Fels has also published works on the baths and sanatoria of Switzerland (2d ed. 1885), and Germany (1885), and edited a guide-book on South France.

Guacharo, or OIL-BIRD (*Steatornis caripensis*), a remarkable South American bird, with characters which seem to unite it to owls and goatsuckers, but differing from the latter in having a strong bill, and being frugivorous. The food of the guacharo consists of hard and dry fruits. It is about the size of a common fowl; the plumage brownish gray, with small black streaks and dots. The guacharo is a nocturnal bird, a circumstance very singular among

Guacharo (*Steatornis caripensis*).

frugivorous birds. It spends the day in deep and dark caverns, where great numbers congregate and make their nests. It was first known from Venezuela, but has since been discovered in Peru, Trinidad, and elsewhere in the northern South American region. Humboldt gives a most interesting account, in his Personal Narrative, of a visit to the great Guacharo Cavern in the valley of Caripe, near Cumana. This cavern is visited once a year for the sake of the fat of the young birds, which are slaughtered in great numbers, and their fat melted and stored for use as butter or oil. The clarified fat is half liquid, transparent, inodorous, and will keep for a year without becoming rancid.

Guaco. See ARISTOLOCHIA.

Guadalaja'ra, (1) an old and decayed town of Spain, capital of the province of the same name, on the Henares, 35 miles NE. of Madrid by rail, with some unimportant manufactures of flannel and serge, and a royal college of engineering. Here is the quaint, neglected palace of the Mendozas, whose tombs, in the *Panteon* below the chapel of San Francisco, were barbarously mutilated by the French. Pop. 8524.—The *province* occupies the northern part of New Castile (see CASTILE), is in the great central plain, and has an area of 4870 sq. m., with a pop. of 203,000.—(2) Capital of the Mexican state of Jalisco, and the third city of the republic, lies in a fertile valley by the Rio Grande de Santiago, here crossed by a fine bridge of 26 arches, 280 miles WNW. of Mexico city, with which the place is connected by rail. Though most of the houses are of only one story, the town presents a pleasing appearance, with wide streets crossing at right angles, numerous public squares, and a fine shaded *alameda*; there are several lines of tramway, and water is supplied by an aqueduct over 20 miles long. Guadalajara is the seat of an archbishop, and possesses a handsome cathedral, besides the government palace, a mint, university, hospitals, and school of art. Its industries are important: it is the chief seat of the cotton and woollen manufactures of the country; and the Guadalajara

pottery and metal wares, like the confectionery, have a reputation all over Mexico. Pop. (1895) 95,000.

Guadalaviar (anc. *Turia*), a river of eastern Spain, has its source near that of the Tagus, in the south-west of Aragon, and after a course of 190 miles, in a generally south-south-east direction, falls into the Mediterranean at Grao, 1½ mile below Valencia. In passing through the beautiful Huerta de Valencia, it is divided, for purposes of irrigation, into numerous channels.

Guadalquivir (Arab. *Wádi-al-Kebir*, 'the great river;' anc. *Bætis*), the most important river of Spain, and the only one that, fed by the rains in winter and the Sierra Nevada's melting snows in summer, presents at all seasons a full stream. It rises in the Sierra de Cazorla, in the east of the province of Jaen, flows in a general south-west direction through the provinces of Jaen, Cordova, Seville, and, forming the boundary for about 10 miles between the provinces of Huelva and Cadiz, falls into the Gulf of Cadiz at San Lucar de Barrameda, after a course of 374 miles. Strelbitsky estimates its drainage area at 21,580 sq. m. The principal towns on its banks are Cordova and Seville, to the last of which, about 80 miles above its mouth, the river is navigable for steamers. Below Seville it twice divides itself into two branches, forming two islands—the Isla Menor and the Isla Mayor. Its chief affluents are the Guadajoz and the Jenil on the left, and the Guadalimar and the Guadiato on the right. At Montoro it breaks through the outlying spurs of the central Sierra Morena in a series of rapids, but its lower course is sluggish and dreary in the extreme; the stream itself is turbid and muddy, and eats its way through an alluvial level given up to herds of cattle and to waterfowl. There are no villages in this district, which, though favourable to animal and vegetable life, is fatal to man, from the fever and ague caused by the numerous swamps. During the equinoctial rains the river rises sometimes 10 feet, and the country is yearly flooded as far up as Seville, to which point the tide is noticeable.

Guadalupe Hidalgo, 5 miles by tramway N. of Mexico city, is the chief place of pilgrimage, and its brick cathedral the richest in all Mexico; for here is preserved a miraculous picture of a brown Virgin, painted on a peasant's coarse cloak. The treaty which ended the war with the United States was signed here, 2d February 1848.

Guadeloupe, one of the Lesser Antilles in the West Indies, and the most important of those which belong to France, lies about 77 miles N. by W. of Martinique, and contains, including dependencies, 494 sq. m., with a pop. in 1895 of 168,000, mostly blacks and mulattoes. It is divided into Grande-Terre on the east, and Basse-Terre or Guadeloupe proper on the west, by a strait of from 40 to 150 yards in width, which bears the name of Salt River, and is navigable only for vessels of very light tonnage. The nomenclature of the two islands appears curiously perverse, for Basse-Terre is the loftier of the two, and Grande-Terre is the smaller; consequently the name Basse-Terre is now generally applied solely to the capital (pop. 7600), a town of officials mainly, in the south-west of the island. Grande-Terre, generally low, is of coral formation; Basse-Terre, on the contrary, is traversed by volcanic mountains, which culminate in La Soufrière (the 'Sulphur Mine') at a height of 5497 feet. Earthquakes are frequent, and in the towns the houses are now built of wood or iron. The chief product of the island is sugar; coffee also is exported. The annual commerce, including imports and exports (about equal) exceeds £2,000,000; more than half of this trade is with France. Point-à-Pitre (q.v.) is the principal town and port; Le Moule, on the eastern coast of Grande-Terre, has 8500 inhabitants, and Grand-Bourg, on Marie-Galante, 7300. The colony is administered by a governor, assisted by a general council; primary education is free and compulsory, and there is a good *lycée* at Point-à-Pitre. The dependencies of Guadeloupe are the neighbouring islets of Désirade, Marie-Galante, and Les Saintes, besides St-Barthélemy and part of St-Martin to the north-west. Guadeloupe was discovered by Columbus in 1493, but it was not till 1635 that it was colonised by the French; and after repeatedly falling into the hands of England, during her wars with France, it was at length permanently ceded to the latter power in 1816.

Guadiana (Arab. *Wádi Ana*, the anc. *Anas*), one of the five principal rivers of the Iberian peninsula, formerly regarded as rising in the desert Campo de Montiel, where a stream which drains the small Lagunas de Ruidera flows north-west and disappears within a few miles of the Zancara. It was long believed that this stream reappeared in a number of springs and lakes that rise some 22 miles to the south-west, known as the *Ojos* ('Eyes') of the Guadiana, and connected by a small stream with the Zancara; but it has now been ascertained that the waters which disappear higher up find a short underground way to the Zancara, which is therefore the true Upper Guadiana. Rising in the east of the plateau of La Mancha, it flows at first south and west to the *Ojos*, below which point it receives the name of the Guadiana. It follows a sinuous westerly course as far as Badajoz, then bends southward, forms for some miles the boundary between Spain and Portugal, and flows through part of the province of Alemtejo, returning to form the frontier again, until it empties into the Gulf of Cadiz. It is about 510 miles in length, but is navigable only for about 42 miles. Its chief affluents are the Jabalon, Zujar, Matachel, Ardila, and Chanza, all on the left.

Guaiacum, a genus of trees of the natural order Zygophyllaceæ, natives of the tropical parts of America. The flowers have a 5-partite calyx, five petals, ten stamens, and a tapering style; the fruit is a capsule, 5-angled and 5-celled, or the cells by abortion fewer, one seed in each cell. The trees of this genus are remarkable for the hardness and heaviness of their wood, known variously as *Lignum Vitæ*, as *Guaiacum-wood*, and as *Brazil-wood*; as well as for their peculiar resinous product, *Guaiacum*, often but incorrectly called a gum. The species to which the commercial Lignum Vitæ and Guaiacum are commonly referred is *G. officinale*, a native of some of the West India islands, and of some of the continental parts of America; a tree 30 or 40 feet high, leaves abruptly pinnate, with two or three pairs of ovate, obtuse, and perfectly smooth leaflets, pale blue flowers in small clusters, which are succeeded by compressed roundish berries, a furrowed bark, and generally a crooked stem and knotty branches. It seems probable, however, that other species, as well as this, supply part of the guaiacum-wood and resin of commerce. At present they are obtained chiefly from Cuba, Jamaica, and St Domingo. The wood is imported in billets about 3 feet long and 1 foot in diameter, of a greenish-brown colour. This is the colour of the heart-wood; the sap-wood is pale yellow. Guaiacum-wood is remarkable for the direction of its fibres, each layer of which crosses the preceding diagonally; annual rings are scarcely to be observed, and the pith is extremely small. It sinks in water. It is much valued, and used for many purposes, chiefly by turners; ships' blocks,

rulers, pestles, and bowls (see BOWLS) are among the articles most commonly made of it. When rubbed or heated, it emits a faint disagreeable aromatic smell; its taste is also pungent and aromatic. Shavings and raspings of the wood are bought by apothecaries for medicinal use. The bark is also used in medicine on the continent of Europe, although not in Britain. The virtues of both wood and bark depend chiefly on the resin which they contain, and which is itself used in powder, pill, and tincture. It is an acrid stimulant, and has been employed with advantage in chronic rheumatism, in chronic skin diseases, in certain cases of scanty and painful menstruation (and hence it is occasionally an effectual remedy in cases of sterility), and in chronic catarrh. It has also been highly praised as a preventive of gout. The resin is an ingredient of the well-known *Plummer's Pills*. In the 16th and 17th centuries Guaiacum was the remedy most in repute for syphilis. It is used in testing Blood-stains (q.v.). The resin sometimes flows spontaneously from the stem of the Guaiacum tree; it is sometimes obtained artificially. It is of a greenish-brown colour, and has a brilliant resinous fracture.

Guaiacum officinale.

It has scarcely any taste, but leaves a burning sensation in the mouth. One of its most striking characteristics is that it is coloured blue by its oxidising agents. It contains *guaiacic acid*, $HOC_{13}H_7O_3$, which closely resembles benzoic acid, and yields, on distillation, certain definite compounds known as *guaiacen*, *guaiacol*, and *hydride of guaiacyl*.

Guaira, LA, the port of Caracas (q.v.), on a narrow, shadeless strip of land between the mountains and the Caribbean Sea. Efforts have been made to improve the harbour by the construction of a breakwater and wharves. The average value of the imports is almost £1,000,000, and that of the exports nearly as much. Pop. (1887), with two neighbouring villages, 15,293. La Guaira is often referred to in Kingsley's *Westward Ho!*

Gualeguay, a town of Entre Rios, Argentine Republic, on the Gualeguay River, which flows into a tributary of the Paraná: there is a railway (7 miles) to Puerto Ruiz at its mouth. The town has a tannery, steam-mills, and large slaughter-houses and beef-salting establishments. Pop. 11,000.

Gualeguaychú, a town of Entre Rios, Argentine Republic, on the Gualeguaychú River, which enters the Uruguay 11 miles below. Besides slaughtering and salting works, it has an extract-of-beef factory. Pop. 14,000.

Guan, or YACOU (*Penelope*), a genus of large game birds (Gallinæ) of the family Cracidæ,

Guan (*Penelope cristata*).

among the representatives in the New World of the grouse and pheasants in the Old. It is represented by fourteen species distributed from southern Texas through Mexico to Paraguay. The guans are graceful birds, with long tails, handsome, variegated plumage, bare, dilatable patches of skin on the throat, and naked spaces round the eyes. They live mostly on trees, descending to the ground in search of their food, which consists of fruits, berries, and insects. They are remarkable for their loud, frequent cries, from which the Spaniards call them squalling pheasants. Their flesh is much esteemed, and they fall a constant and easy prey to the hunter.

Guanabacóa, a town of Cuba, lying in a small fertile plain among rocky hills, 5 miles E. of Havana. It has two barracks and a military hospital. The population is officially returned at nearly 30,000.

Guanaco. See HUANACO.

Guanajuato, an inland state of Mexico, with an area of 12,500 sq. m., and a pop. in 1893 of 1,007,116. The greater part of the surface belongs to the lofty plateau of Anahuac (q.v.), and is traversed by the Sierra de Gorda in the north, and the Sierra de Guanajuato (11,030 feet) in the centre; the south-west portion belongs to the fertile plain of Bajio. The riches of Guanajuato consist chiefly in its valuable mineral products; there are large numbers of gold, silver, lead, copper, and quicksilver mines still worked. Stock-raising is of some importance, but agriculture is little pursued, although the soil yields most products of both the temperate and tropical zones; a noteworthy article of export is chillies (see CAPSICUM). Large cotton and woollen factories have been established by foreigners.—GUANAJUATO, the capital, is curiously situated on both sides of a deep ravine, traversed by a mountain-stream that in the rainy season is swelled to a foaming torrent. The streets are steep and tortuous, the houses frequently of four or even five stories. The public buildings include a large government palace, a mint, barracks, a cathedral, several convents and colleges, an art-school, and the Alhondiga, a public granary. The electric light and telephones have been introduced. Surrounded by a district honeycombed with mines, Guanajuato presents mainly the appearance of a mining-town; its handsomest private houses belong to the wealthy proprietors of mines, and it contains several amalgamation works, others lining the cañon for several miles. There

are also blanket factories and cotton-printing works. Pop. 52,112.

Guanare, capital of the state of Zamora, in Venezuela, stands on a river of the same name, and has a pop. of 10,390.

Guanches, the aborigines of the Canary Islands (q.v.).

Guanin is a yellowish-white, amorphous substance, which derives its name from its being a constituent of guano; but it also forms the chief constituent of the excrement of spiders, has been found attached to the scales of fishes—the bleak, for example—and seems to be a normal constituent of the mammalian liver and pancreas. With regard to its occurrence in guano, as it has not been found in the recent excrement of sea-birds, there is every reason to believe that it is formed by slow oxidation (from atmospheric action) of the uric acid, much as uric acid can be made to yield urea and oxalic acid. And in the pancreas and liver it probably represents one of those transitory stages of disintegrated nitrogenous tissue which are finally excreted by the kidneys in the more highly oxidised form of urea. Guanin is a diacid base, but also forms salts with metals, and combines with salts. When heated with hydrochloric acid and potassium chlorate, it is oxidised to carbon dioxide, guanidin, and parabanic acid.

Guano (derived from the Peruvian word *huano*, 'dung') is the excrementitious deposit of certain sea-fowl, which was found in immense quantities on certain coasts and islands where the climate is dry and free from rain. Although the use of guano as a manure is comparatively recent in Britain and in Europe, its value in agriculture was well known to the Peruvians long before the coming of the Spaniards. Alexander von Humboldt first brought specimens of guano to Europe in 1804, and sent them to Fourcroy, Vauquelin, and Klaproth, the best analytical chemists of the day.

The commercial value of guano depends almost entirely upon the amount of decomposition to which it has been subjected by the action of the atmosphere, the value consisting as it does essentially of nitrogenous and phosphatic compounds, the former being chiefly ammonia salts derived from the decomposition of the uric acid and urates which exist in the fresh excrement. The ammoniacal portion of these deposits, and some of the phosphates, are tolerably soluble in water, and are readily washed away by rain. There are three classes of guanos: (1) those which have suffered little by atmospheric action, and which retain nearly the whole of their original constituents, such as the Angamos and Peruvian guanos; (2) those which have lost a considerable portion of their soluble constituents, but remain rich in their less soluble constituents—the phosphates of lime and magnesia, such as the Ichaboe, Bolivian, and Chilian guanos; (3) those which have lost nearly all their ammonia, and contain but little more than the earthy phosphates of the animal deposit—many being further largely contaminated with sand. In the last class must be placed the various African guanos (excepting that from Ichaboe), West Indian guano, Kuria Muria (islands off the coast of Arabia) guano, Sombrero guano, Patagonian guano, Shark's Bay guano (from Australia), &c.

Most of the so-called Peruvian guano has been obtained from the Chincha Islands off the coast of Peru. The following table represents the mean of 78 samples of Peruvian guanos:

Moisture	13·67
Organic matter and salts of ammonia	52·05
Earthy phosphates	22·78
Alkaline salts containing 3·34 phosphoric acid, and equal to 6·89 soluble phosphate of lime	9·67
Sand, &c.	1·83
	100·00
Ammonia per cent.	16·52

The following table gives the mean of several analyses of the inferior kinds of guano, the first four belonging to the second class and the remaining three to the third class:

	Ichaboe (older deposits)	Ichaboe (later deposits)	Chilian.	Bolivian.	Patagonian.	Kuria Muria.	Saldanha Bay
Moisture	27·3	20·0	20·4	10·1	25·0	18·1	20·0
Organic matters and salts of ammonia	34·3	24·4	18·6	21·6	18·3	12·4	14·9
Earthy phosphates	30·3	20·4	31·0	51·5	44·0	42·7	56·4
Alkaline salts	5·0	6·2	7·3	14·1	2·1	4·2	5·8
Carbonate of lime						4·1	
Sand, &c.	3·1	29·0	22·7	2·7	10·6	18·5	2·9
	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Ammonia, per cent.	7·3	6·0	5·47	4·5	2·5	2·05	1·47

The nitrogen in these analyses is calculated as ammonia for the purpose of comparison. In reality it exists in various forms of combination—viz. as uric acid, urea occasionally, urate, oxalate, hydrochlorate, phosphate, &c., of ammonia, other urates, Guanin (q.v.), and undefined nitrogenous compounds. Hence, as may be inferred, a complete analysis of guano is a work of very considerable labour; but, as its agricultural value depends mainly on the quantities of ammonia, soluble and insoluble phosphates, and alkaline salts which it contains, such analyses as those we have given are sufficient for practical purposes, and they are easily made.

If the value of a manure be calculated, as is done by Boussingault and other chemists, according to the amount of nitrogen which it contains, one ton of good Peruvian guano is equal to 33⅓ tons of farmyard manure, 20 tons of horse-dung, 38½ tons of cow-dung, 22½ tons of pig-dung, or 14½ tons of human excrement.

The introduction of guano into Britain as a manure is comparatively recent. In 1840 only 20 casks of it were imported. In 1841 Lord Derby spoke strongly in its recommendation at a meeting of the Agricultural Society; and from that time it came rapidly into use. In 1850 the import was 116,925 tons; in 1870, 280,311 tons; but in 1880 it had fallen to 80,497 tons; and from 1885 to 1888 it had still further decreased from 25,000 to 17,000 tons. Its value as a fertiliser has been so much appreciated, and its use so extensive, that it is gradually going out of the market owing to the diminution of supplies, its place being taken by various artificial substitutes (see MANURE). See J. C. Nesbit's pamphlet, *History and Properties of Natural Guanos* (new ed. 1860).

FISH-GUANO. The organic fertiliser commonly known as Fish-guano may be shortly defined as fish dried and ground to powder. The value of fish as a fertiliser is universally admitted, and is evidenced by the eagerness shown by farmers, who reside in districts where fish can be easily and cheaply obtained, in acquiring and applying it to their land. Mussels, five-fingers or starfish, herrings, and particularly sprats may be instanced as the fish most generally used in this way. The inconvenience and expense arising from this mode

of application to the soil, on account of the bulky as well as the unpleasant nature of the material, is obvious, the non fertilising moisture alone amounting to between 60 and 80 per cent., and by so much enhancing the cost of general haulage. The desirability of converting raw fish into a concentrated and portable powder comparatively free from moisture was first practically realised only shortly before 1862 by M. Rohart, whose product was obtained from the refuse of the Norwegian cod fisheries by drying the heads and backbones of the codfish upon heated floors after they had been sun-dried on the rocks, and subsequently grinding them between millstones to a floury powder.

Of late years fish-guano has grown rapidly in favour among agriculturists, a preference based doubtless upon its merits as a fertiliser, and probably also due to its similarity both as regards origin, analysis, and effect to Peruvian guano. The supplies of Peruvian guano, as is now generally known, are practically exhausted, the imports into the United Kingdom having fallen from about 300,000 tons per annum in years gone by to about 17,000 tons in 1888. Not only in quantity is Peruvian guano deteriorating, but also in quality, the ammonia, for example, found by Voelcker in 1864 being 18·62, whereas in 1889 the very best shows only 9·50, and others vary from 6·50 per cent. down to as low as 3 per cent.

In some quarters nitrate of soda has been named as the probable substitute for Peruvian guano; but, although its supplies are at present enormous, the character, composition, and action upon the soil are entirely different, one being of a mineral and the other of an organic origin. Fish-guano may be held to contain the fish with its natural properties of nitrogen and phosphoric acid in full; while Peruvian guano, which is the accumulation during ages of the excrement of birds whose main food has been fish, must have suffered by the action upon the fish of the digestive organs of the birds, as well as the effect of the weather upon the deposits. Fish-guano may therefore be considered as the best substitute for the failing supplies of Peruvian guano. Another advantage is the fact that the available supplies of fish in Norway, Canada, Newfoundland, and elsewhere are practically inexhaustible. Fish guano, according to the fish from which it is made, analyses from 9 to 14 per cent. of ammonia, and from 13 to 32 per cent. of phosphate of lime. At the present time the selling price per ton is fixed, as regards the ammonia it contains, by the ruling market price per unit of that ingredient in nitrate of soda, and, as regards the phosphate of lime, by the price of bone and Calcutta bone-meal. The market value of fish-guano varies, according to the analyses, from about £6 to £8 per ton weight. One ton of fish-guano is said to be equal in chemical effect to seventeen times its weight in farmyard manure.

Of the most generally known fish-guano there may be said to be four kinds. There is the 'raw' guano made in Christiansund and the Lofodens, upon M. Rohart's principle, which is used principally in Germany. There is also a guano made in London, Hull, and elsewhere, from fish which has been condemned by the authorities as unfit for human food. This description, naturally, embraces fish of all kinds and sizes, its great drawback being the large quantity of oil left in the guano, the presence of which element is prejudicial to any fertiliser. By far the largest quantity of fish-guano is manufactured in various parts of Norway, but principally at Brettesnoes, in the Lofodens, by Jensen & Co., who make as much as 5000 tons per annum. This guano is made from the heads and backs of the codfish, and also from the herring. In both instances the 'raw stuff' is artificially dried and ground, much time being saved by this process, instead of waiting some months until the bones were sufficiently dried by the sun. To make 1000 tons of cod-guano 7,000,000 heads are necessary, and to obtain these 50,000 tons weight of fish have to be caught. The oil found in this guano is practically nil. The 'herring-guano' is obtained by extracting the oil and moisture by means of pressure from the herrings; the 'cake' thus obtained is then ground in the ordinary way by means of disintegrators, the result being a fine powder of high manurial value. Guano obtained from the cod analyses about 10 per cent. of ammonia and 30 per cent. phosphates, the latter high figure being due to the large predominance of bone over fleshy or nitrogenous matter. The contrary is the case in the herring-guano, in which the fleshy matter is very much greater than the bony substance, the analysis being about 13 per cent. each of ammonia and phosphate. Guano is also made in Canada and elsewhere from lobster and crab shells, and this is stated to be a valuable manure for garden purposes. The annual production of fish-guano is estimated at the present time at 15,000 tons, including that made in England, Scotland, Norway, Sweden, Newfoundland, Nova Scotia, and the United States of America. For Rock-guano, see APATITE.

Guaporé, a navigable river of South America, rises in Brazil, and for some distance forms the boundary between Bolivia and Brazil. It unites with the Mamore to form the Madeira (q.v.).

Guarana, from the seeds of a plant belonging to the genus Paullinia (natural order Sapindaceæ), from whose seeds *Guarana Bread*, a kind of food, is prepared by the Guaranis and other savages of Brazil. *P. sorbilis* is the species which yields the paste called Guarana bread. It is made in round or oblong cakes, which are regarded in all parts of Brazil as very efficacious in the cure of many disorders, and which contain, besides other substances, some of them nutritious, a considerable quantity of a substance supposed to be identical with theine or caffeine. It has been used medically in the United States and Europe. The Brazilians pound the Guarana bread, sometimes called 'Brazilian cocoa,' in water, sweeten it, and use it as a stomachic and febrifuge. It is also reputed aphrodisiac.—The genus Paullinia contains several species remarkable for their extremely poisonous properties. In the bark, leaves, and fruit of *P. pinnata* abounds a principle which slowly but surely causes death, and is employed for that purpose by the Brazilians; the dangerous Lechequana honey is obtained from *P. australis;* and from *P. cupana*, a native of the banks of the Orinoco, an intoxicating drink is procured.

Guarantee Associations, joint-stock companies on the insurance principle, which become security for the integrity of cashiers, travellers, and other employees, on payment of an annual sum calculated either upon the salary or upon the amount for which the association holds itself liable. The advantage of the system is that it obviates the necessity of requesting private friends to become sureties. See GUARANTY, and CAUTION.

Guaranty, or GUARANTEE, is a contract by which one person binds himself to pay a debt or do some act in case of the failure of some other person, whose debt or duty it is, to do the thing guaranteed. The person so binding himself is generally called the surety in England, while the person who is primarily liable is called the principal. Thus, where A borrows money, and B joins as a party in a bill of exchange or a bond to secure the loan, B is a surety. Where B guarantees that certain goods which are supplied to A shall be paid for, he is

more usually styled a guarantor than a surety, but the liability is the same.

Such a contract must be in writing, for the Statute of Frauds (29 Charles II. chap. 3) required that no action should be brought whereby to charge the defendant upon any special promise to answer for the debt, default, or miscarriage of another person, unless the agreement or some memorandum or note thereof should be in writing and signed by the party to be charged therewith, or some other person by him lawfully authorised. So that a surety can only be bound by some writing signed by himself or his agent. And Lord Tenterden's Act (9 Geo. IV. chap. 14, sect. 6) enacted the same thing as to persons making representations as to the character, ability, or dealings of another, with intent that the latter may obtain credit. In order to bind the surety, there must also be no deceit or misrepresentation used as to the nature of the risk or as to the state of the accounts. If a guaranty is given to a firm, it is not binding after a change in the firm, unless the parties expressly stipulate to the contrary. If the creditor discharges the principal, or even gives time, by way of indulgence to him, the surety is released, for he is thereby put to a disadvantage. In general, the creditor can sue either the principal or the surety for the debt at his option. If the surety is obliged to pay the debt of his principal, he can sue the principal for the money so paid, and is entitled to have all the securities assigned to him, so as to enable him to do so more effectually. If one of two or more sureties is made liable for the whole debt, he may call upon his co-sureties to contribute equally with himself. For the Scotch law, see CAUTION.

Guardafui, CAPE, the most eastern point of the African continent, and the extremity of an immense promontory (the Somali country) stretching seaward in an east-north-east direction, and washed on the north-west by the Gulf of Aden and on the south-east by the Indian Ocean. The cape is in 11° 50′ N. lat. and 51° 14′ E. long.

Guardian, in English law, is the legal representative and custodier of infants—i.e. persons under the age of twenty-one. The feudal law of guardianship was very elaborate; but its provisions have not been of practical importance since the abolition of the Court of Wards in 1641. Under the modern law, a father may, by deed or will, appoint guardians for his child. Parents themselves are called guardians by nature or for nurture; a father has the custody and control of his children, at least until they attain the age of fourteen; and this right passes at his death to the mother, either alone or jointly with any guardian whom he may have appointed. The courts appoint guardians when necessary; thus a guardian *ad litem* is appointed to defend an action brought against an infant; and if an infant is made executor a guardian is appointed to administer during his minority. If the infant is old enough to do so, he is sometimes permitted to choose his guardian. A guardian is in a fiduciary position, and his powers are usually exercised under control of the court. For his powers in regard to the infant's marriage, see INFANT.

The guardian of a lunatic is usually called a committee. In Scotland the word 'guardian' is sometimes used in reference to lunatics, but seldom applied, except in a popular sense, to those who have the custody and care of children. In corresponding cases in Scotland the custody of a child under twelve, if female, or fourteen, if male, belongs to her or his tutor; and from those ages to twenty-one the child has no legal guardian, being *sui juris*, but the care of the child's property belongs to a Curator. For guardians of the poor, see POOR LAWS.

Guardian Angels. See ANGEL.

Guards are in all armies the élite of the troops, and form the sovereign's bodyguard. In the British service the Guards compose what is called the Household Brigade, and include the 1st and 2d Life Guards, the Royal Horse Guards (see CUIRASSIERS), the Grenadier Guards (three battalions), Coldstream Guards (two battalions), and Scots Guards, formerly Scots Fusiliers (two battalions), or about 1300 cavalry and 6000 infantry. Before the abolition of purchase, the officers of the Foot Guards held higher army rank than that they bore regimentally—i.e. ensigns ranked with lieutenants of other regiments, lieutenants with captains, captains with lieutenant-colonels; and by exchanging into the line they were enabled to take rank above officers of much longer service. When purchase was abolished in 1871, it was decided that officers joining the Guards after that date should not hold this exceptional rank. The brilliant services of the French Guard in the Napoleonic wars are well known. See also the articles NATIONAL GUARD, SCOTS GUARDS, SWISS GUARDS.

Guardship is a term used in two senses. In the first place it is applied to a guardship of reserve, which is practically a depôt ship for men employed in vessels of the royal navy out of commission; and of these there are only three, stationed at Sheerness, Portsmouth, and Plymouth. In the second place the term is applied to vessels of the royal navy which are stationed at other ports on the coast; they are the headquarters of the different coastguard districts, and are kept manned with reduced crews; they can complete their crews at any time from the men in the coastguard, and so manned can proceed to sea at once as a fighting squadron, and, indeed, are supposed to be in the English Channel ready for action in four days after a mobilisation order is issued. The Royal Naval Reserve in some cases do their drill on board these ships, which, however, are in no sense guard (i.e. defence) ships for the particular ports at which they are stationed.

Guarea, a genus of tropical American trees of the natural order Meliaceæ, of some of which the bark is used as an emetic and purgative. *G. grandifolia* is called Musk-wood in some of the islands of the West Indies, the bark smelling so strongly of musk that it may be used as a perfume. Although the tree attains timber size and has been employed for making rum hogsheads when other material was scarce, the wood contains a bitter resinous substance, the flavour and smell of which is communicated to the spirits to their detriment.

Guarini, GIOVANNI BATTISTA, poet, was born at Ferrara, 10th December 1538, studied at Pisa, Padua, and Ferrara, and was appointed to a chair at Ferrara. At the age of thirty he accepted service at the court of Ferrara, and was entrusted by Duke Alfonso II. with various diplomatic missions to the pope, the emperor, Venice, and Poland. He died in 1612 at Venice. As a poet, he is remarkable for refined grace of language and sweetness of sentiment, while his defects are occasional artificiality, a too constant recurrence of antithetical imagery, and an affected dallying with his ideas. His chief and most popular work, *Il Pastor Fido* ('The Faithful Swain'), obtained a high measure of popularity on its appearance, and passed through forty editions in the author's lifetime, though it is really an imitation of Tasso's *Aminta*. An incomplete) edition of Guarini's varied writings, including sonnets, comedies, satires, and political treatises, was published at Verona in 1737 (4 vols.). See the monograph by Rossi (Turin, 1886).

Guarino (Lat. *Varinus*), a learned Italian, born at Verona in 1370, went to Constantinople in

1388 to learn Greek under Chrysoloras. After his return, he taught in Verona, Padua, and Bologna, was called to Prince Lionello of Ferrara, acted as interpreter at the Council of Ferrara, and died in 1460. He performed great services for the revival of classical studies; wrote Greek and Latin grammars; translated parts of Strabo and Plutarch; and helped to establish the text of Livy, Pomponius Mela, and Pliny. See monographs by Rosmini (1806) and Sabbadini (1885).

Guarnieri, or GUARNERI, the name of one of the three celebrated families of violin-makers who flourished at Cremona in the 17th and 18th centuries. The most notable of the family were ANDREA (fl. 1650–95), a pupil of Niccolo Amati, and his sons GIUSEPPE (fl. 1690–1730) and PIETRO (fl. 1690–1725); and his nephew GIUSEPPE, commonly called Giuseppe del Gesù, who flourished 1725–45, and whose violins were not inferior to those of the Stradivari.

Guastalla, a small town of Italy, on the Po, 19 miles by rail NE. of Parma. The seat of a bishop (since 1828), it has an old castle, and a school of music. Guastalla gave name in 1406 to a countship, in 1621 to a duchy. Pop. 2648.

Guatemala, a republic of Central America, lying between 13° 46′ and 17° 44′ N. lat., and bounded on the W. and N. by Mexico; on the E. by Belize, the Gulf of Honduras, and the republic of Honduras; on the S. and W. by San Salvador and the Pacific. Part of the frontier, however, is not yet fixed, the boundary line towards Yucatan in particular being still undetermined. In the absence of government surveys the area is estimated at some 46,600 sq. m., much of which is wholly unexplored, so that the course of even the larger rivers and the direction of the main mountain chains, as laid down in the maps of the country, are to a considerable extent hypothetical. The greater part of Guatemala is mountainous, the highlands having a mean elevation of about 7000 feet above the sea; but the surface presents great variety, with extensive plateaus, terraces, and upland valleys—the last notable for their beauty, fertility, and favourable climate. The main chain runs generally parallel with the Pacific coast, which it approaches within fifty miles; on this side the slope is steep and broken by many volcanoes, while towards the Atlantic it sinks in gentle incline, with subsidiary ranges extending to the water's edge. Of the volcanoes several are active; the most noted is Fuego (12,075 feet), which lays claim to nearly half of the recorded eruptions in Central America. Agua, from whose crater-lake a deluge of water destroyed the first capital in 1541, has been extinct for centuries. Earthquakes are frequent, and occasionally (as in 1863 and 1874) very severe; sulphur and other hot springs are numerous. Guatemala is well watered, the principal rivers being the Usumacinta, which flows into Campeachy Bay, and the Polochic and Motagua (about 280 miles), which fall into the Gulf of Honduras; yet, owing to the conformation of the country, water in many parts is scarce in the dry season. Those of the streams, moreover, that are navigable possess the ever-present bar common to Central American rivers. The lakes include the Lago de Izabal (36 miles long), below which the Polochic becomes the Rio Dulce; the Laguna del Peten (27 miles by 15); and the Lagos de Atitlan (17 by 8) and Amatitlan (9 by 3).

The climate, except in the low-lying districts, may be described as perpetual spring, and is generally healthy, but the people are for the most part utterly regardless of all sanitary laws. The hot coast-lands on the Pacific are especially liable to visitations of yellow fever. At the capital the temperature ranges from 40° to 87° F., and the annual rainfall is about 53 inches; in the lowlands the mean range is from 70° to 90°; in the uplands ice appears in the dry winters. The rainy season extends generally from April to October, April and May being the hottest months.

Guatemala is as yet of little importance as a mining country, but chiefly because its resources are almost wholly undeveloped. Gold, which is found in most of the river beds, is worked to some extent in the department of Izabal; some silver-mines are also worked, and a mint was established in 1888; and salt and saltpetre are mined, though not in large quantities. Other minerals are lead, iron, copper, coal, quicksilver, marble, porphyry, sulphur, zinc, gypsum, &c. But the wealth of the country consists in its rich soil, which, according to the altitude, yields the products of every zone. The shores are lined with mangroves, the rivers with bamboos, beyond which rise the forests, where the mahogany, the cocoa-nut, cohune, and other palms tower above the wild bananas, ferns, and gingers that scantily cover the bare soil below, whilst the exuberance of orchids and trailing parasites confuses the identity of the trees. In the uplands are forests of huge pines and spruces and oaks, agaves and cherimoyas appear on the hillside, and thick grass clothes the ground; even in the dry lava plains a coarse grass springs up between the lava blocks, and acacias and calabash trees are met with. The forests contain over a hundred kinds of timber trees, including many of the most valuable; yet, owing to the absence of roads and means of transport, Guatemala is obliged to import a large quantity of Californian red-wood and other timber. In 1888 the appointment of keepers of the national forests was ordered. Maize and haricot beans (frijoles) grow freely everywhere, peas and potatoes in sufficient quantity for consumption, wheat in the uplands, and rice in the bottom-lands. Other products are coffee (the chief export), sugar, cacao, india-rubber, tobacco, cotton, pita and sisal hemp, sarsaparilla, and many medicinal plants, bananas, and a number of other fruits, mostly of the finest quality. The export of cochineal, formerly of chief importance, has almost ceased. Cattle are raised sufficient for the needs of the country, though not, as in Honduras, for exportation. The fauna of Guatemala includes the jaguar, puma, ocelot, coyote, red-deer, tapir, peccary, armadillo, and several monkeys; iguanas and turtles are numerous, whereas the alligators are small and not frequent, and boas and venomous snakes, though the number of species is considerable, are seldom met with. The birds are of great variety and beauty, comprising several hundred species; the national emblem is the superbly coloured Quetzal (q.v.). Insects abound, the most notable being the brilliant butterflies, immense beetles, locusts, many kinds of ants, scorpions, tarantulas, grasshoppers, mosquitoes, flies, and jiggers.

The industries of Guatemala are chiefly confined to the manufacture of woven fabrics, pottery, and saddlery; there are several chocolate factories, and flour and saw mills in the country, and numerous distilleries of the fiery *aguardiente*, the sale of which is a government monopoly, yielding about a fourth of the annual revenue. San José, the chief port, Champerico, and Ocos, all on the Pacific, are merely open roadsteads, provided with iron piers; but Santo Tomás, on the Atlantic side, has a good harbour; and in 1883 Livingston, at the mouth of the Rio Dulce, was proclaimed a free port for ten years, since when the trade has considerably increased. The development of the country, however, is greatly hampered by the absence of serviceable roads, which are for the most part represented

by rough mule-tracks. For the five years ending 1894, the average annual imports amounted to about 7,000,000 dollars, the average annual exports to about 15,000,000 dollars. The imports, of which Britain supplies nearly a third and the United States a sixth, are chiefly specie, cotton, woollen, and silk goods, wines and spirits, railway plant, and flour; the principal exports are coffee, sugar, fruits, and hides.

About a third of the people are said to be of European descent, and the rest aborigines (Maya-Quichés); but this rough division takes no account of the mixed races, which embrace nearly a score of distinct crosses recognised by separate names; these Ladinos greatly outnumber the comparatively few pure descendants of the Spanish invaders or settlers. The Indians of the northern forest-country are wild and uncivilised. A census taken in 1880 returned the population at 1,224,602; that of 1890 recorded a total of 1,460,017. The capital, Guatemala la Nueva, in 1895 had 85,000 inhabitants, Quetzaltenango 20,000, Chimaltenango and Antigua Guatemala about 14,000. The state religion is the Roman Catholic, which is practically the only form in use, although others are allowed by the constitution. But many of the fine old churches of the country are crumbling to ruin; and it is said that scarcely a tenth of the population ever enter those that remain in use. About a fourth of the births are illegitimate, the larger proportion occurring among the whites. Since 1879 primary education has been compulsory and gratuitous. There are now about a thousand primary schools of all kinds, attended by some 50,000 pupils; excellent high schools for boys are found in the capital, Quetzaltenango, and Chiquimula, and for girls in the capital and at Belen; and schools of law, medicine, engineering, philosophy, literature, and music are also provided.

Guatemala is divided into twenty-two departments, under civil governors. The executive is vested in a president, elected for six years by direct popular vote; he appoints six secretaries of state, who with nine others form the council. The assembly is elected by universal suffrage, to the number of one for every 20,000 of the population. The standing army consists nominally of about 2500 men, the militia of nearly 65,000. This force is a heavy drain on the resources of the country, whose finances are not in a flourishing condition. Calculated at the average rate of 6½ dollars per pound sterling, the revenue is about £1,000,000, but the expenditure generally exceeds the revenue. In 1895 the internal debt was returned (on the same calculation) at £964,000, the floating debt at £400,000, and the foreign debt at £890,000—making a total of near £2,500,000, including past interest. To meet the increase in the floating debt, which has grown up since 1887, large quantities of paper money have been put in circulation. But on the whole it must be said that of late the interest on both the internal and the foreign debt has been punctually paid, and the bonds have risen greatly in value.

Guatemala was conquered in 1524 by Cortez' lieutenant, Alvarado, with every accompaniment of cruelty and oppression. After three centuries of harsh and greedy rule, under which the viceroyalty of Guatemala embraced all that is now known as Central America, independence was proclaimed, 15th September 1821. A confederation survived with difficulty from 1824 to 1839: it fell before the attacks of Rafael Carrera, an uneducated Indian of low birth, who founded the present republic, and *reigned* over it until his death in 1865. From 1871 until he was killed in a war with Salvador in 1885, General Barrios was president, and under his iron rule the country made considerable progress; monastic orders were rigorously suppressed, and much of the church property was confiscated and appropriated to the uses of public education and for other purposes. There are at present only two short lines of railway (150 miles) in operation: a line from Puerto Barrios, on the Atlantic, to Guatemala city, to connect the Atlantic with the Pacific, was commenced in 1884, but in the meantime has been abandoned. There are in the republic 180 post-offices, and 2500 miles of telegraph.

The best work on Guatemala is Brigham's *Guatemala, the Land of the Quetzal* (1887). See also Stephens, *Incidents of Travel in Central America* (New York, 1841); Dollfus and Montserrat, *Voyage archéologique dans les Républiques de Guatemala et de San Salvador* (Paris, 1868); Boddam Whetham, *Across Central America* (Lond. 1877); Laferrière, *De Paris à Guatemala* (Paris, 1877); a paper by Mr A. P. Maudslay in *Proc. Roy. Geog. Soc.* (1883); Charnay, *Les Anciennes Villes du Nouveau Monde* (Paris, 1885); Stoll, *Zur Ethnographie der Republik Guatemala* (Zurich, 1884), and *Guatemala, Reisen und Schilderungen* (Leip. 1886); a very full report by Consul-general Hayes Sadler, in No. 600 of 'Diplomatic and Consular Reports' (1889); for the geography, Lemaire, *Guia geográfica* (Guatemala, 1881); and for the early history, Milla y Vidaurre, *Historia de la América Central* (Guatemala, 2 vols. 1879).

Guatemala (*Santiago de Guatemala*; also *Guatemala la Nueva*), capital of the republic of Guatemala, and the largest and most important city of Central America, stands on a wide plateau, nearly 4900 feet above sea-level, and 72 miles by rail NNE. of its port, San José. It is regularly built, with wide, roughly-paved streets running at right angles, and houses nearly all of one story; the extensive suburbs are inhabited chiefly by Indians. In the plaza the metropolitan cathedral towers above the government buildings, which include the large, one-story residence of the president. There are numerous other churches, several large hospitals, and the archbishop's palace. Education is cared for in the Instituto Nacional, with laboratories, a museum, a zoological garden, and a good meteorological observatory; and in well-appointed schools of arts and design, agricultural and business colleges, normal schools, a polytechnic institute, and schools of law and medicine—all supported by government. Other public structures are two large general markets, a subsidised theatre, and a bull-ring. Tramways and the electric light have been introduced, and there are a score of public fountains and washing-places; but the water, brought 6 miles by an aqueduct, is not good. There are some manufactures and a considerable commerce, all the foreign trade of the republic being concentrated here. Pop. (1895) 85,000.—The present city of Guatemala is the third capital of that name. The first, now called *Ciudad Viejo*, lies on the plain between Fuego and Agua. It was founded by Alvarado in 1524, and destroyed in 1541 (see GUATEMALA). It has a population now of some 3000 Indians. The second capital, *Guatemala la Antigua* (Old Guatemala), 2½ miles NE. of the first and 21 miles WSW. of the present capital, was one of the finest cities of America, with a hundred churches and 60,000 inhabitants; in 1773 it was for the second time destroyed by an earthquake, but among the noble ruins a new city has arisen, lit also with the electric light, and sheltering a population of at least 14,000.

Guava (*Psidium*), a genus of trees and shrubs of the natural order Myrtaceæ, mostly natives of tropical America, and some of them yielding fine and much-valued fruits. They have opposite entire, or almost entire leaves, a 3–5-lobed calyx, 4–5 petals, and a 1–5-celled berry with many-seeded cells.—The Common Guava or White Guava (*P.*

pyriferum) is a low tree of 7–20 feet, with numerous branches, obtuse smooth leaves 2–3 inches long, and fragrant white flowers on solitary axillary stalks. It is said to be a native alike of the East and West Indies, and is now much cultivated in both. It is not improbable, however, that it was introduced into the East Indies from America, but it has now become fully naturalised; it is to be seen in the jungle around every cottage in Ceylon. It has long been occasionally grown as a stove plant in Britain. The fruit is larger than a hen's egg, roundish or pear-shaped, smooth, yellow; the rind thin and brittle; the pulp firm, full of bony seeds, aromatic, and sweet. The jelly or preserve made from it is highly esteemed, and is now regularly imported into Britain from the West Indies and South America. The rind is stewed with milk, and is also made into marmalade. This fruit is rather astringent than laxative. Guava buds, boiled with barley and liquorice, make a useful astringent drink in diarrhœa.—The Red Guava (*P. pomiferum*), also now common in the East as well as in the West Indies, produces a beautiful fruit, with red flesh, but not nearly so agreeable as the white guava. It is very acid.—The China Guava (*P. Cattleianum*), a native of China, produces fruit readily in vineries in Britain. It is a larger tree than the white guava. The fruit is round, about the size of a walnut, of a fine claret colour when ripe, growing in the axils of the leaves; the pulp purplish-red next the skin, becoming paler towards the centre, and there white, soft, subacid, in consistence and flavour resembling the strawberry. It makes an excellent preserve. It succeeds in the open air in the south of France.—On some of the mountains of Brazil grows a dwarf species of Guava, called Marangaba (*P. pygmæum*), a shrub, 1–2 feet high, with fruit about the size of a gooseberry, much sought after on account of its delicious flavour, which resembles that of the strawberry.—The Bastard Guava of the West Indies is a species of Eugenia (q.v.).

Guava (*Psidium pyriferum*): a, section of fruit.

Guaxaca. See Oaxaca.

Guayaquil, chief commercial city of Ecuador, and capital of Guayas province, lies in the fertile valley of the Guayas, some 30 miles above its mouth. From the river the town, with its pagoda-like towers, presents an imposing appearance, which is not borne out on closer inspection, and the climate is hot and unhealthy, yellow fever being very common. Most of the houses are built of bamboo or wood and earth, and covered with creepers. The custom-house is the most noteworthy of the public buildings, which include a cathedral and a town hall. The town, however, is now lit with gas, there is a complete system of tramways, and the streets are gradually being paved; while in 1888 considerable progress was made with much-needed water works. In 1889 a statue to Bolivar was erected. The leading manufacturing establishments are combined steam sawmills, foundries, and machine-shops; there are also ice-factories and a lager beer brewery; and the place is noted for its straw hats and hammocks. Ships drawing 18 feet can come up to the breakwater, and below the town there is a wharf, with a dry-dock opposite. The railway into the interior was stopped at Chimbo (60 miles). Most of the trade is in the hands of foreigners; of 200 vessels of 150,000 tons that clear the port annually, nearly half the ships, and more than half the tonnage, are British. Annual exports average £1,300,000, of which cocoa represents nearly five-sixths; the other principal items are coffee, ivory-nuts, rubber, hides, and specie. About 7 per cent. is shipped to Britain, and 14 per cent. to the United States. The town was founded by Orellana in 1537, and removed to its present site in 1693. Pop. about 30,000. The Bay of Guayaquil is the only important bay on the west coast of South America north of Patagonia.

Guayas, a fertile coast-province of Ecuador, with an area of about 9000 sq. m., and a pop. (1895) of 98,640. Its chief product is cocoa, of a very high quality. Capital, Guayaquil.

Guaymas, a well-sheltered port of Mexico, on the Gulf of California, the terminus of the Sonora Railway (353 miles by rail S. by W. of Benson, an Arizona station on the Southern Pacific Railroad). It is a small place, excessively hot, surrounded by barren mountains, and mostly inhabited by Indian fishermen; but already it exports precious metals, wheat, flour, &c. in considerable quantities, and its trade is increasing. Pop. 5000.

Guayra. See Guaira.

Gubbins, a half-savage race in Devon, are mentioned by the pastoral poet, William Browne, in 1644, in a poem on Lydford Law, printed in Westcote's *Devon*. He says:

> This town was crossed with beastly [illegible],
> But [illegible] [illegible] [illegible]

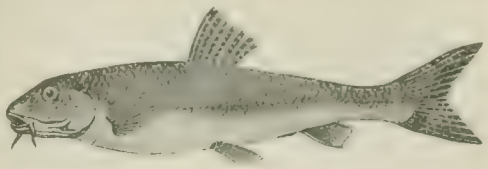
patriarch of the family died at Whitstone, having spent the decline of his days in an old cider cask. After the death of the grandmother, about 1860, the family got into difficulties of one sort or another, and were dispersed.

Gubbio (anc. *Iguvium* or *Eugubium*), a city of central Italy, on the south-western declivity of the Apennines, 20 miles NNE. of Perugia. It has a 13th century cathedral, several medieval palaces—the Brancaleoni with a valuable picture-gallery—and remains of an ancient theatre. The celebrated Engubine Tables (q.v.) are preserved in the town-house. Gubbio was noted for its majolica ware, which was brought to perfection by Giorgio Andreoli in 1517–37, by his delicate use of a beautiful ruby lustre. Two celebrated yellow lustres were also used on Gubbio majolica. A few factories still imitate the medieval fayence. From a town of 30,000 inhabitants, it has dwindled to 5540 since its incorporation in the duchy of Urbino in 1384.

Guben, a manufacturing town and river-port of Prussia, in the province of Brandenburg, at the head of the navigable portion of the Neisse, 28 miles S. of Frankfort-on-the-Oder. The principal staples are hats and cloth. There are also wool spinning, tanning, machine factories, &c. The town was destroyed by the Hussites in 1434 and 1437, and was twice occupied by the Swedes during the Thirty Years' War. Pop. (1875) 23,738; (1885) 27,086; (1890) 29,328.

Gubernatis, Angelo de, an eminent Italian orientalist and busy *littérateur*, who was born at Turin, April 7, 1840. He studied at the university there, and afterwards at Berlin under Bopp and Weber; and was appointed extra-ordinary professor of Sanskrit at Florence in 1863, and ordinary professor in 1869. Becoming attracted by the wild socialistic dreams of Bakunin, he left his chair in order to be more free, and married Bakunin's niece; but a closer acquaintance with subversive socialism soon restored him to his reason. He became a candidate anew for his chair, and after some not unnatural hesitation was re-elected. His earliest works were mostly contributions to Sanskrit scholarship, alternating with incessant contributions to his own and to others' journals. He made his reputation European by his *Zoological Mythology* (Lond. 1872), a work hopelessly marred by rashness in speculation, but yet serviceable; *Storia comparata degli usi Natalizi* (1872), *Storia comparata degli usi Funebri* (1873), *Mitologia Vedica* (1875), *Storia dei Viaggiatori Italiani nelle Indie orientali* (1875), *Mythologie des Plantes* (Paris, 1878), *Lettere sopra l'Archæologia Indiana* (1881), and *Lettere sopra la Mitologia comparata* (1881). In the region of biography and literary history he has published *Ricordi biographici* (1873), the great *Dizionario biografico degli Scrittori contemporanei* (1879–80); monographs upon Giovanni Prati, Manzoni, and others; and finally *Manuale di storia della Litteratura Indiana* (1882), and the ponderous *Storia universale della Litteratura* (15 vols. 1882–85). De Gubernatis has shown phenomenal industry and many-sidedness, and has made real contributions to learning, but he must not be taken too seriously as a mythologist. He became professor of Sanskrit at Rome in 1891.

Gudgeon (*Gobio*), a genus of small, carp-like (Cyprinoid) fishes common in the fresh waters of Europe. The dorsal fin is short, without a spine; the mouth is directed downwards, and has little barbules at the angles; the scales are of moderate size; and there are two rows of hooked pharyngeal teeth. The common gudgeon (*G. fluviatilis*), which abounds in many English rivers, especially in those that run over gravel, is a small fish rarely exceeding 8 inches in length, with upper parts olive-brown, spotted with black, and the under parts white. The gudgeons swim in shoals, and, like the barbels, feed on worms, molluscs, and other small animals.



The Common Gudgeon (*Gobio fluviatilis*).

Angling for gudgeon requires no art, so readily are the fish lured. Though small, the fish are esteemed for the table. Besides the British gudgeon, which is widely distributed on the Continent, there is only another species (*G. uranoscopus*), also European, but apparently restricted to the river-basins of the Danube and Dniester; allied genera occur in the East.

Gudrun, or Kudrun, an old German epic, built up out of the popular songs and traditions of the seafaring folk who dwelt on the shores of the North Sea between Elbe and Seine. It relates the history of three generations of the kings of the Hegelings (Frisians), and in the third part tells how Gudrun, the daughter of Hettel, king of the Hegelings, was carried off from her home by Hochmut, son of the king of Normandy, how she preferred to work like the lowest maidservant in the house of Hochmut's mother, and endure the greatest indignities, rather than break her troth pledged to Herwig, king of Zealand, and how finally she was rescued by her brother and her betrothed. This poem, which has been entitled the German *Odyssey*, as the *Nibelungenlied* is sometimes called the German *Iliad*, was written, or rather arranged and edited, by an unknown poet in Austria, in all probability in the end of the 12th century. The best editions are by Karl Bartsch (4th ed. 1880), Martin (1872), and Symons (1883); and the best translations into modern High German by Simrock (8th ed. 1873) and Weitbrecht (1884).

Guebres (from Turkish *giaour;* cf. Arab. *kafir*, 'unbeliever'), the followers of the ancient Persian religion as reformed and consolidated by Zoroaster. The name Guebres is supposed to have been first bestowed upon this sect by their Arabic conquerors in the 7th century; they are also known as Parsees (q.v.). See also Persia, Zoroaster.

Guebwiller. See Gebweiler.

Guelderland (*Geldern, Gelderland*), a province of the Netherlands, is situated between the Zuider Zee on the north-west and the Prussian dominions on the south-east. It has an area of 1957 sq. m., and a pop. (1896) of 548,748, two-thirds Protestants. It is watered chiefly by the Meuse, the Yssel, the Rhine, and the Waal. The surface is undulating, and about Arnheim, the capital, and Nimeguen are the most picturesque districts in the Netherlands. The climate is healthy, and the soil, though very unequal, is on the whole good; the southern district, Betuwe (see Batavi), is one of the most fertile tracts in Europe. Agriculture is prosecuted with great success. Wheat, rye, buckwheat, tobacco, &c. are extensively grown. Among the manufactures, beet-sugar, spirits, bricks and tiles, paper, and cotton goods are the principal. The duchy of Gueldres or Guelderland was more extensive than the modern Dutch province, stretching southwards along the Meuse to beyond Venlo. It was originally inhabited by the Batavi and Sigambri, and after

them by the Franks. In 870 it passed to Germany; and in the end of the 11th century became a territorial power, its ruler bearing the title of count. This was exchanged for the higher title of duke in 1383. These dynastic princes maintained their independence for just one century longer; in 1483 their duchy was taken possession of by Maximilian of Austria. Yet it was not until 1543 that the power of the Duke of Gueldres was finally broken and his land definitively incorporated with the Austrian Netherlands. On the revolt of the northern provinces of Holland the northern part of Gueldres threw in its lot (1579) with them, whilst the southern part remained faithful to Spain. The latter was given up to Prussia in 1713. By the peace of 1814 Gueldres was finally divided between Holland and Prussia.

Guelder Rose, a cultivated form of *Viburnum Opulus* (see VIBURNUM), also popularly named Snowball Tree. The normal or wild form of the

Fig. 1.—The Guelder Rose.

guelder rose is a pretty plentiful native of England and Ireland, but is less frequently to be found in a wild state in Scotland. It is widely distributed in Europe and Russian Asia, and even extends into the Arctic regions. Its flowers appear in early summer in rather dense cymes, 2 or 3 inches in diameter; the outer flowers become much enlarged, attaining about an inch in diameter, but, having neither stamens nor pistils, are perfectly barren. The inner flowers are small, white, with two or three pistils on very short styles, and are followed by globular, blackish-red berries. In the cultivated form the flowers are all monstrous and barren, like the outer flowers of the cymes of the wild form; and crowded as they are together in the cyme, the structure of which is not enlarged, the inflorescence assumes the form of a compact ball, hence the name Snowball Tree. In cultivation the plant attains the proportions of a small tree, and flowers most freely after it has acquired some age. When in flower in May and June it is one of the most ornamental of hardy trees, and is therefore planted largely in pleasure-grounds and shrubberies. The wild form is reared from seeds and cuttings, the monstrous form from cuttings or layers only.

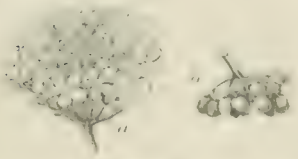


Fig. 2

Guelph, an inland port of entry in Ontario, capital of Wellington county, on the river Speed, 45 miles W. by S. of Toronto by rail. It is the seat of the Ontario Agricultural College, and has several flour-mills, woollen-mills, and manufactories of sewing-machines, &c., the Speed supplying abundant motive-power. Pop. (1891) 10,537.

Guelphic Order, an order of knighthood for Hanover, instituted by George IV., when Prince Regent, in 1815. It is both a military and civil order, and is unlimited in number. See ORDERS.

Guelphs and Ghibellines, the names of two great parties, the conflict between which may be said almost to epitomise the history of Italy and Germany from the 11th to the 14th century. The origin of these names was formerly the subject of much speculation; but historians are now agreed in tracing them respectively to the two families, Welf and Waiblingen, which in the 12th century were at the head of two rival parties in the German empire, and whose feuds came to be identified historically with the respective principles for which these parties contended. Welf was the personal name of a prehistoric founder of the family still represented in the royal English and (dispossessed) Hanoverian houses; Waiblingen, a small town in Würtemberg, was a possession of the House of Hohenstaufen. The assumption of the names as party names is traditionally fixed at the battle of Weinsberg, in Swabia, 1140, between the Emperor Conrad of Hohenstaufen (Duke of Franconia) and Welf, uncle of Henry the Lion, Duke of Saxony, when the leaders rallied their followers by the respective war-cries, 'Hie Waiblingen!' 'Hie Welf!' It may be mentioned that Matthew Villani ingeniously gives as etymology of Ghibellini, *Guasta balia* or *guidatori di battaglie*, 'leaders in battles;' of Guelfi, *guardatori di fe*, 'defenders of the faith.'

As the chief theatre of the conflict of these parties was Italy, the original names took the Italian forms of *Ghibellini* and *Guelfi*. The former may, in general, be described as the supporters of the imperial authority in Italy, the latter as the opponents of the emperors. The opposition to imperial authority in Italy arose from two distinct parties, which, for the most part, made common cause with each other from the church, which asserted its own spiritual independence, and from the minor principalities and free cities, which fought for their provincial or municipal rights and liberties. Five great crises in the strife of the Guelph and Ghibelline parties are commonly noted by historians: under Henry IV., in 1055; under Henry the Proud of Bavaria and Saxony, in 1127; under Henry the Lion, in 1146; under Frederick Barbarossa, in 1159; and in the pontificate of the great champion of churchmanship, Innocent III. The cities of northern Italy were divided between the two parties—Florence, Bologna, Milan, Piacenza, Modena, Ravenna, and others, as a general rule, taking the side of the Guelphs; while Pisa, Lucca, and Arezzo were Ghibelline. Several important cities transferred their sympathies from the one party to the other according to the exigencies of domestic politics. The great Italian families, in like manner, took opposite sides; but the policy of each family frequently varied from one generation to another. In general, it may be said that the nobles of the more northern provinces of Italy inclined to the Ghibelline side, while those of the central and southern provinces were Guelph. By degrees, however, especially after the downfall of the preponderance of the German emperors in Italy, the contest ceased to be a strife of principles, and degenerated into a mere struggle of rival factions, who availed themselves of the prestige of ancient names and traditional or hereditary prejudices. Even in 1272 Gregory X. could with truth reproach the Italians with their sanguinary animosities for the sake of

what were but names, the meaning of which few of them could understand or explain; and, in the following century, in 1334, Benedict XII. practically disallowed altogether the reality of the grounds of division between the parties, by proscribing, under pain of the censures of the church, the further use of those once-stirring names, which had long been the rallying words of a pitiless warfare. From the 14th century we read little more of Guelphs or Ghibellines as actually existing parties; but in the sense already explained the conflict of principles which they represent is found in every period of history. See Bryce, *The Holy Roman Empire* (9th ed. 1888); Oscar Browning, *Guelphs and Ghibellines* (1893).

The reigning family of Great Britain occupy the throne in virtue of the Act of Settlement of 1701, which made Sophia, daughter of Frederick, elector Palatine, and of Elizabeth, daughter of James I. of England, heiress of the English crown. Sophia married Ernest Augustus, Duke of Hanover, the fourth son of George, Duke of Brunswick-Lüneburg, a direct descendant of the prince of Guelph blood in whose favour Frederick II. created the duchy of Brunswick-Lüneburg in 1235. See Hanover.

Guercino, 'the squint-eyed,' properly Gian-Francesco Barbieri, a painter of the Bolognese school, was born 2d February 1590, at Cento, not far from Bologna. His earliest studies in painting were made in his native town; then from 1619 to 1623 he visited different cities of Italy, particularly Rome and Venice, to improve himself in his art. In 1642 he went to live at Bologna, where he became the head of a flourishing school of painting, and there he died 22d December 1666. Guercino's early paintings show perceptible signs of L. Caracci's and Caravaggio's influence. Later in life he softened the harshness of his light and shade contrasts by more harmonious colouring in Guido Reni's style. He left a very large number of pictures. His masterpieces are considered to be the fresco of 'Aurora,' in the Villa Ludovisi; the 'Death of Dido,' in the Spada Palace; and 'Saint Petronilla,' in the Capitoline Gallery, all three at Rome.

Guericke, Heinrich Ernst Ferdinand (1803–78), a theologian belonging to the Old Lutheran school, was professor at Halle, and author of a well-known *Handbuch der Kirchengeschichte* (1853; 9th ed. 1866–67); of a *Christliche Symbolik* (1839; 3d ed. 1861); and of a *Lehrbuch der Christlichen Archäologie* (1847; 2d ed. 1889).

Guericke, Otto von, a celebrated physicist, was born at Magdeburg, in Prussian Saxony, 20th November 1602. His personal history contains nothing of interest. As a natural philosopher he is chiefly known by his experiments regarding the nature and effects of air, his discovery of the air-pump (1650), and of the Magdeburg Hemispheres (q.v.). He made also some notable observations in electricity. He was for a time engineer in the Swedish army, and afterwards Burgermeister of Magdeburg. He died at Hamburg, 11th May 1686.

Guerillas, the name given to armed bands who, on occasion of foreign invasion or civil war, carry on an irregular warfare on their own account. This class of fighters belong peculiarly to Spain, where from 1808 to 1814 they were systematically organised against the French, whose operations they very seriously embarrassed. The country itself also suffered from them. Many of them, particularly Mina's band, joined Wellington, and, after having undergone a course of discipline, rendered signal service as regular troops. On the conclusion of peace large numbers were organised into robber-bands. In most of the civil wars of Spain since 1820 guerilla warfare, especially in the Basque provinces, has played a prominent part. See Brigands.

Guérin, Georges Maurice de, a young poet of exceptional genius, was born at the château of Le Cayla in Languedoc, 4th August 1810, and was educated for the church at a Toulouse seminary and the Collége Stanislas, Paris, after which he entered the community gathered together by Lamennais at La Chesnaye in Brittany, but followed his master in his estrangement from Rome and renounced his novitiate in October 1833. He next went to Paris to try journalism, and became a teacher at the Collége Stanislas, but married a rich Creole lady in November 1838, and entered on a new life of rest and happiness, which was cut short by his untimely death of consumption, 19th July 1839. An article by George Sand in the *Revue des Deux Mondes* (May 15, 1840) first drew attention to his genius: his *Reliquiæ*, including the *Centaur* (a kind of prose poem), letters, and poems, were published in 1860, edited by G. S. Trébutien, with a critical notice by Sainte-Beuve. In the words of the latter, 'no French poet or painter has rendered so well the feeling for nature—the feeling not so much for details as for the *ensemble* and the divine universality, the feeling for the origin of things and the sovereign principle of life.'— Eugénie de Guérin, his sister (1805–48), had something of her brother's genius grafted upon a profound and mystical religion, and devoted herself with more than sisterly devotion to his memory. Her own *Journals* were published in 1861; her *Lettres*, in 1864. Both were translated into English.

See Sainte-Beuve, *Causeries du Lundi* (vol. xii.) and *Nouveaux Lundis* (vol. iii.); Marelle, *Eugénie et Maurice De Guérin* (Berlin, 1869); Harriet Parr, *M. and E. De Guérin, a Monograph* (1870); and Matthew Arnold's *Essays in Criticism* (1865).

Guérin, Pierre Narcisse, Baron, French painter, was born at Paris, 13th May 1774. A pupil of Regnault's, he first attracted notice by his 'Marcus Sextus' (1799), the first of a series of classic subjects, skilfully treated, but showing something of melodramatic effect. After a visit to Rome and Italy in 1802, he settled in Paris. From 1822 to 1829 he was director of the French Academy of Painting in Rome, and he died there on 6th July 1833. Amongst his pupils were Géricault, Delacroix, and Ary Scheffer.

Guernsey, the second in size of the Channel Islands (q.v.). It is about 30 miles in circumference, and 28 sq. m. in area. Pop (1861) 29,805; (1881) 32,638; (1891) 35,287—with Herm and Jethou. The lowest part is to the north (L'Ancresse), the highest to the south (Haut Nez) being 349 feet above sea-level. St Peter Port, the only town, has a good harbour, open at all tides; there is a large public school, founded 1563, and named after Queen Elizabeth; a fine church, dating from the 13th century, which has been well restored; a library with museum and lecture-rooms due to the beneficence of Messrs Guille and Allés; and another at Candie House, founded by the late O. de B. Priaulx. There is also a good public market, a ladies' college, poor-house, and lunatic asylum. Guernsey consists entirely of primitive rock covered with gravel and a surface of sandy loam. The climate is equable and favourable to the growth of fruit, flowers, and vegetables. Two-thirds of the island are under cultivation, and great quantities of fruit and vegetables are exported to England, as is also a hard gray granite much used in building. It is 127 miles from Land's End, 109 from Falmouth, 113 from Southampton, 69 from Start Point. Steamers to England daily, Sundays excepted. Taxation is light; the annual revenue of the bailiwick—which includes Alderney and Sark

is £30,000, derived from harbour dues, excise, market dues, and sundry other sources. The island is divided into ten parishes each administered by a *douzaine* of twelve ratepayers. There is a separate lieutenant governor for Guernsey appointed by the crown, and the constitution is similar to that of Jersey (q.v.), but more oligarchic. It is said that there are no moles or reptiles in the island.

Guerrazzi, FRANCESCO DOMENICO, Italian patriot and brilliant writer, was born at Leghorn, 12th August 1804, and, educated for the legal profession, won a great reputation among his countrymen by his political fictions, which exercised an immense influence on contemporary Italian events by their exalted strain of patriotic enthusiasm. Guerrazzi's own words are, 'he wrote a book when impotent to fight a battle.' On the eve of the definite breach between the people and the Grand-duke of Tuscany in 1849, Guerrazzi was induced to accept office in the ministry. On the flight of the Grand-duke he was proclaimed member of the provisional government, and subsequently dictator. During this crisis of the state he energetically refused his adhesion to 'the substitution of republicanism for monarchy;' and preserved the strict autonomy of Tuscany until the return of the grand-ducal rule. Then he was immediately seized and imprisoned on the grounds of having neglected due measures of repression when the revolution first gathered strength during his ministry. His defence, entitled *Apologia della sua Politica di F. D. Guerrazzi* (1857), is a masterpiece. After an imprisonment of three years, he was condemned for life to the galleys, but was subsequently permitted to select Corsica as the refuge of his perpetual banishment. Restored to liberty and action by later events, Guerrazzi sat in the parliament of Turin in 1862 and 1865. He died 23d September 1873. His chief works of fiction are *La Battaglia di Benevento*, remarkable for exquisite expression and beautiful poetic imagery (1827, fifty times reprinted); *L'Assedio di Firenze*, a magnificent historical novel, treating of the downfall of the republic of Florence (1836, more than thirty times reprinted); *Isabella Orsini* (1844); *Beatrice Cenci* (1854); *L'Asino* (1857). There are works on Guerrazzi by Cerona (1873), Fenini (1873), and Bosio (1877); and Carducci has edited his Letters (2 vols. Leghorn, 1880–82).

Guerre'ro, a southern state of Mexico, on the Pacific, with an area of 22,863 sq. m. It is a broken mountainous country, rich in minerals, fertile in the upland valleys, and enjoying a favourable climate except on the coast. Pop. (1895) 417,621. Capital, Chilpancingo (6000); chief port, Acapulco (q.v.).

Guesclin, BERTRAND DU, Constable of France, was born of an ancient family near Dinan in the district of Rennes, about either 1314 or 1320. From his boyhood upwards he excelled in all martial exercises. In the contests between Charles de Blois and Jean de Montfort for the dukedom of Brittany he took part with the former, especially distinguishing himself at Vannes (1342). After King John had been taken prisoner by the Black Prince at the battle of Poitiers in 1356, Du Guesclin contended successfully against the English, his valour and military skill being especially shown at Rennes (1356) and Dinan (1357). Then, entering the service of the Dauphin, afterwards Charles V., he took Melun (1359) and several other fortified towns, and freed the Seine from the English. On Charles's accession to the throne in 1364 Du Guesclin was created governor of Pont orson, and in May of the same year gained the battle of Cocherel against Charles the Bad of Navarre. But on the 29th September following he was defeated and taken prisoner by the English, under Sir John Chandos, at the battle of Auray, and only liberated on payment of a ransom of 100,000 livres. He next supported Henry, Count of Trastamare, against Pedro the Cruel, king of Castile, but was defeated and taken prisoner by the Black Prince near Najera (1367). Being again ransomed on payment of a large sum, Du Guesclin renewed the contest, and in 1369 defeated and captured Pedro at Montiel, and placed the crown of Castile on the head of Henry of Trastamare. Immediately afterwards he was recalled by Charles V. of France, at that time hard pressed by the English, and was raised to the dignity of Constable of France. In the year 1370 Du Guesclin opened his campaigns against the English, and in a few years the whole of their possessions were in the hands of the French, with the exception of a few fortified towns. While assisting at the siege of Châteauneuf de Randon, in Languedoc, Du Guesclin was taken ill, and died July 13, 1380. See Lives of him by Cuyard de Berville (1767; new ed. 1882), Jamison (1863), Luce (1883), and Postel (1893).

Guess, GEORGE. See CHEROKEES.

Guest, EDWIN, a learned antiquary, born in 1800, entered Caius College, Cambridge, in 1819, was eleventh wrangler in the Mathematical Tripos of 1824, and was thereafter elected to a fellowship. He was called to the bar, but did not practise, and early gave himself to antiquarian and literary studies. The only book he published was his well-known *History of English Rhythms* (1838; 2d ed. revised by Professor Skeat, 1882)—a work of great erudition, and written, moreover, before the era of good editions of old English poetry had begun. His frequent papers on the early history of Roman and Saxon England and the English were printed in the *Archæological Journal* and the *Transactions* of the Archæological Institute and other learned institutions, and earned the praises of scholars so critical as Mr Freeman. These were collected posthumously, filling the second volume of *Origines Celticæ (a Fragment), and other Contributions to the History of Britain* (2 vols. 1883). The first volume was devoted to the Celts and their ethnological and philological affinities; but, truth to tell, this work, laborious as it is, was conceived in a pre-scientific spirit, and its elaborate etymologies are valueless. In 1852 Guest succeeded Dr Chapman as Master of Caius College, Cambridge, and next year received the degree of LL.D. He became F.R.S. in 1841, and was Vice-chancellor of the university in 1854. He resigned the mastership but a few weeks before his death, which took place on November 23, 1880.

Gueux, or 'The Beggars,' the name assumed by the confederated nobles and other malcontents who opposed the introduction of the Inquisition into the Low Countries by Philip II. of Spain. Forming themselves into an association, November 1565, they presented, on 5th April following, a formal protest to the regent, Margaret of Parma. Their distinctive party name they adopted from an abusive epithet applied to them on that occasion by one of Margaret's courtiers. The 'beggars,' who represented the national feeling of the country, maintained a long and vigorous contest against the despotic proceedings of Philip and his advisers, but were ultimately compelled to succumb to superior force. A branch of them, 'the Beggars of the Sea,' under the leadership of the bold Count de la Marck, seriously harassed the Spanish fleet, captured transports with supplies for Alva's army, seized several fortresses, and succoured besieged places along the coast. Their capture of Briel in April 1572 was the beginning of the war which

terminated in the independence of the Netherlands in 1648. See HOLLAND.

Guevarism. See EUPHUISM.

Guevi. See ANTELOPE.

Guglielmi, PIETRO, a celebrated musician and composer, was born at Massa di Carrara in May 1727. His first opera, composed at the age of twenty-eight, was greeted with enthusiasm at Turin. He visited the chief cities of Italy, everywhere with success. After a residence of some months at Dresden and various other towns, Guglielmi passed over to London, where he remained five years. At the age of fifty he returned to Naples with the double prestige of great fame and wealth, and in 1793 Pope Pius VI. appointed him *Maestro di Cappella* at St Peter's. He died 19th November 1804. Among his most popular operas were *La Didone; Enea e Lavinia; I due Gemelli; La Serva Innamorata; La Pastorella Nobile; La Bella Pescatrice.*

Guiana, in its widest signification, is the region lying between the Orinoco and the Amazons in South America, with the Atlantic on the east and no definitive boundaries on the west. It consists of five divisions, known respectively as Venezuelan, British, Dutch, French, and Brazilian Guiana, the first named situated to the west of the next three, and the last named to the south of all four. But both Venezuelan and Brazilian Guiana being incorporated in those states, we have to describe here only British, Dutch, and French Guiana.

These three colonies abut upon the Atlantic, in the order named, between Venezuela on the north and Brazil on the south. The physical conformation is practically the same in all three. Next the Atlantic is a fringe of alluvial soil, lying in many parts below the sea-level, and generally inundated in the rainy seasons, with mud-flats skirting the coast and sandbanks jutting out into the ocean; these last are generally held together by the roots of mangrove-trees, though not unfrequently they are of a shifting character, forming temporary islands and moving about under the impulse of wind and tide and river current. This alluvial zone, varying in width from 10 to 40 miles, and consisting principally of blue argillaceous soil, of very great fertility, contains virtually the only cultivated territory in the three colonies. Beyond it the contour rises by a series of short terraces or land waves up to an undulating savannah region of moderate elevation (average 150 feet), which is formed geologically of the accumulated detritus brought down from the primitive mountain masses in the interior. The third and innermost division of colonial Guiana consists of the upland country, a plateau region ridged with mountain-chains (which rise in places to 3000 or 3500 feet), and everywhere covered with a dense primeval forest, exceptionally rich in magnificent timber-trees—rich not only in the quality of the timber, but also in the variety of the species. This division is as yet almost wholly unknown, save that the courses of most of the larger rivers have been explored to their sources.

Rivers.—The whole of Guiana is well provided with rivers. Most of them flow north or north-east to the Atlantic, and bring down with them vast quantities of sedimentary matter, which becomes deposited as the alluvial mud of the coast. These streams, although they are of admirable service for irrigation purposes, are of little use as waterways for navigation, owing to the mudbanks which choke their mouths, the sandbanks which obstruct their channels, and the numerous falls and cataracts by which their waters descend from the highlands and savannah plateaus to the low-lying coastal belt. Up to the line of the rapids and falls, however, they are navigable by small vessels for distances varying from 10 to 150 miles. Several of them are connected together in their lower courses by cross-channels and artificial canals. Indeed, communication in the colonies is principally effected by water, not by land.

Climate.—The climate, as beseems a region lying between 1° and 8° N. lat., is hot and moist, but on the whole tolerably uniform. Generally speaking, the thermometer ranges from a maximum of 95° to a minimum of 70° F.; the average, however, deviates but little from 80° to 84° F. The heat is tempered by sea-breezes during greater part of the year. The rainfall is heavy; the average for British and Dutch Guiana is 75 to 100 inches annually, and in French Guiana it is still heavier, sometimes reaching 140 inches in the year. The precipitation is, however, greatest in the interior; hence the great number of rivers fed from the wooded mountain-slopes inland. Two rainy and two dry seasons are distinguished: the former last as a rule from December to February and from April to August. Hurricanes are extremely rare.

Flora.—As would be expected from the nature of the country, vegetation is of extraordinary richness and luxuriance. Many of the numerous timber-trees are valuable for shipbuilding, house-building, roofing, cabinetmaking, &c. Several useful gums are yielded, and also balsams, wax, bark, fibre, oil, nuts, juices, medicinal preparations, &c., caoutchouc, balata gum, copaiba balsam, carapa-seed oil, sarsaparilla, cinchona, laurel oil, calabashes, silk cotton, tonqua beans, arnotto, Bromelia flax, angelica, cotton, tobacco, &c. The best-known food-plants comprise the cassava, sweet potato, arrow-root, capsicum or Spanish pepper, tomato, guava, cherry, avogato, bread-fruit, melon, granadilla, banana, pine-apple, earth-nut, yam, rice, and maize. Besides these there is a prodigious quantity of creepers, ferns, tree-ferns, and flowers; amongst these last must be specially named the orchids, which often form a continuous carpet along the tops of the forest trees, and the magnificent Victoria regia lily.

Fauna.—The most conspicuous branch of the fauna is the birds, the most characteristic forms being the stink-bird (a vulture), eagles, owls, nightjars, humming-birds, the bell-bird, several passerine species, orioles, a wren, toucans, jacamars, trogons, puff-birds, kingfishers, anis, parrots, the cock of the wood, curassows, tinamous, trumpeters, the jacana, the horned screamer, sand-pipers, the sun-bittern, herons, ducks, and divers. Mammals are not so plentiful as the extensive uninhabited forests might perhaps suggest. They are represented by jaguars, tiger cats, peccaries, tapirs, deer, sloths, armadillos, ant-eaters, agoutis, capybaras, opossums, raccoons, coatis, porcupines, squirrels, monkeys, martens, fish-otters, and manatees. Other forms of animal life are swarms of insects, including butterflies, crickets, mosquitoes, sandflies, and jiggers; turtles and tortoises, crocodiles, iguanas, frogs, snakes, including the anaconda and whip snakes; several Siluroid fishes, the electric eel, rays, sharks, and the sawfish.

Indians.—The native Indians, who still for the most part lead a 'wild' life in the forests, constitute several different tribes, and seem to belong to what were probably two distinct stocks, the indigenes and their original conquerors, the Caribs. In many parts of Guiana rude attempts at picture-writing exist on the rocks and faces of the hills. Two varieties have been discriminated—one deeply incised, the other merely scratched. Who the authors were is not known with certainty; they are generally believed to have been the ancestors of the existing Indians, who, however, have

preserved no traditions relating to the inscriptions.

History.—The first Europeans to explore the coast of Guiana seem to have been the Spaniards Alonzo de Ojeda in 1499 and Vicente Pinzon in 1500. Several attempts were made by adventurers of different European nations to found colonies in this region in the later part of the 16th and the early part of the 17th centuries. To this period belong Raleigh's and the other expeditions which visited this part of South America in search of the fabulous gold city El Dorado (q.v.) and the Lake of Parima. Apart from semi-buccaneering expeditions and landings, the first successful colonisation of Guiana seems to have been made by the Dutch, on the Essequibo, shortly before 1613. The English got firm footing at Surinam in 1650, and the French on the Kourou and Oyapock in 1664. Two years later the English seized both French and Dutch Guiana, but restored them in 1667, and at the same time handed over Surinam to the Netherlands in exchange for New Amsterdam—i.e. New York. The French, in 1674, renewed their attempts to settle at Cayenne, and with success; that part of Guiana has remained in their hands ever since. Except for two short periods (1781–83 and 1796–1802), the settlements on the Essequibo, Demerara, and Berbice and in Surinam were held by the Dutch down to 1803, when they were again taken possession of by the English, who at the peace of 1814 restored the last named, but retained the first three. Berbice was at first administered as a distinct colony, but in 1831 it was incorporated with the rest of British Guiana. During slave-holding times sugar-planting brought some degree of prosperity to these colonies; but their productiveness in this respect was very sensibly crippled by the abolition of slavery, which deprived them of their supplies of the requisite kind of labour for the plantations. Since that event coffee and cotton have almost entirely ceased to be grown; and the cultivation of beetroot for sugar caused a serious crisis in Guiana cane-planting. British and Dutch Guiana, however, still show signs of vitality: the cane-sugar industry, if not reviving, is at least not retrograde, whilst gold-mining is a decidedly progressive industry. Except for gold-mining, which however remains stationary, French Guiana is in a hopelessly deplorable condition.

British Guiana, or Demerara, with a coast-line of 320 miles, is separated from Dutch Guiana on the E. by the river Corentyn; on the S. and W., next Brazil and Venezuela respectively, the boundaries have never been definitively determined. The British make the limits of the colony extend southward to the sources of the Essequibo in the Acarai Mountains (about 1° N. lat. and 59° W. long.), and trend thence nearly due east to the head-waters of the Corentyn, whilst the west boundary (going north) coincides with the Takutu and Cotinga as far as Roraima; thence it proceeds north-east to the Imataca range and onwards north to the mouth of the Amacuro. The Venezuelans, however, claim all the region west of the Essequibo right up to the sources of this river. The area of British Guiana is approximately set down at 96,000 sq. m. The western part of the colony is diversified by chains of the Pacaraima or Parima mountain-system, which stretch generally from west to east, as the Imataca range in the north, the Merumé or Pacaraima Mountains, which rise to 3000 feet between 4° and 5° 30′ N. lat., and to some 8000 or 9000 feet in the table-topped Roraima (q.v.), and the Acarai Mountains, which form the southern boundary of the colony as well as the watershed between the Essequibo and the feeders of the Amazons. Between the two ranges last mentioned comes an eastward extension of the great Brazilian savannah region. The more important rivers are the Corentyn, Berbice, Demerara, Essequibo (with its tributaries, the Rapununi and the Mazuruni, and the Cuyuni, an affluent of this last), Waini, and Barima, all flowing north into the Atlantic; and the Takutu, which, supplemented by the Ireng and Cotinga, feeds the Rio Branco, a left-hand tributary of the Amazon. For the disputed Venezuela frontier, the subject of prolonged negotiations which led in 1895 to a threatening message from the President of the United States, see Venezuela.

The leading industry of the colony is the cultivation of the sugar-cane. Wood-cutting and gold-mining are the only other industries of any moment. The exports embrace sugar, average value £1,200,000 per annum; rum to the amount of nearly £100,000; molasses £20,000; timber, shingles, charcoal, cocoa-nuts, balata, and gums. The export of gold increased from £9000 in 1884 to £500,446 in 1894. The total value of the exports, which go principally to the United Kingdom and West Indies, fell from £3,208,631 in 1882 to £2,039,900 in 1895. More than half the exports go to the United Kingdom. The imports (mostly from the United Kingdom), which consist chiefly of flour, rice, dried fish, butter, pork, and beef, fell from £2,224,000 in 1883 to £1,668,750 in 1895.

In 1894 the population was 280,869, and embraced Europeans, Creoles, negroes, coolies from India, Chinese, natives of Madeira and the Azores, and aboriginal Indians; but of these last only some 10,000 are included in the census return. The negroes number 100,000, the East Indians 106,000, the Chinese 3800, the Europeans 2600. Most of the plantation work is done by immigrant coolies from British India and by Chinese.

The colony is divided into three counties, Berbice, Demerara, and Essequibo. The ports are Georgetown (q.v.), the capital, and New Amsterdam. The administration is in the hands of the governor, appointed by the crown, and two legislative councils—the Court of Policy (15 members) and the Combined Court (23 members)—the latter having the control of the finances. Slavery was abolished in the colony in 1834, though the importation of slaves from Africa had practically ceased twenty years before. Compensation was paid to the amount of £4,297,117 for 84,915 slaves (£50, 12s. per head). The colony possesses one line of railway, from Georgetown to Mahaica (21 miles long), telegraphic communication with Europe and the United States, and a good system of postage.

Dutch Guiana, or Surinam, with an area of 46,058 sq. m., and a coast-line of 240 miles, has for its boundary on the west the river Corentyn, on the south the Acarai Mountains and their eastern continuation, the Tumuc-Humac Mountains, and on the east the Maroni or Marowijn, which separates it from French Guiana. It is, however, a matter of dispute between the French and the Dutch which of the two upper branches of this last river—the right-hand arm, the Awa or Lawa, or the left-hand arm, the Tapanahoni—is the upper part of the main stream. The Dutch claim that it is the former, the French the latter. The other rivers of the colony are the Surinam, Saramacca, Coppename, and Nickerie, all flowing into the Atlantic. The greater part of the surface is covered with unexplored primeval forest, scarcely more than 210 sq. m. of the entire area being cultivated. The chief products are sugar, cocoa, gold, rum, molasses, bananas, rice, corn—of which sugar, cocoa, and gold are largely exported. The total annual value of exports is from £300,000 to £500,000; that of imports is from £400,000 to £600,000. Gold-mining has made rapid strides since 1875; the export

having increased in value from £2079 in 1876 to £90,461 in 1886, and £132,400 in 1893, though probably one-fourth more is smuggled out of the colony. In the year 1887 new discoveries of gold were made in the district between the rivers Tapanahoni and Awa, the region, some 8000 sq. m. in extent, which is in dispute between Holland and France. Trade is carried on principally with Holland, the United States, and Great Britain and her dependencies. There is a governor, a supreme council of five (all nominated), and a partly elected colonial assembly. The population, which is very heterogeneous, in 1894 numbered 62,649, of whom nearly one-half live at Paramaribo (q.v.) the capital. In 1884 the total was given at 52,978. Besides these there were about 4000 Bush Negroes —i.e. negroes who escaped during slavery times and subsequently asserted their independence— and 1200 Indians. As in British Guiana, labour is principally performed by coolies from British India and by Chinese. The colony is divided into eight administrative districts and the town of Paramaribo, and is under the charge of a governor, assisted by an executive council. The members of the provincial estates, the legislative body, are elected by the people. Slavery was abolished in 1863.

French Guiana, or Cayenne, is separated from Dutch Guiana on the west by the Maroni, from Brazil on the south by the Tumuc-Humac Mountains, and from the same country on the east by the Oyapock, although the French claim all the coastal districts as far south as the Amazons. The treaty boundary is the 'river of Vicente Pinzon,' the identity of which is the point in dispute; the French government, however, in 1856 expressed itself as willing to recognise the Araguary as the treaty stream. The north and north-east sides of the colony are washed by the Atlantic. Taking the Oyapock as the provisionally accepted boundary, the area of the colony is about 31,000 sq. m., whilst the length of coast-line is about 240 miles; the area, as officially given, is 46,850 sq. m. The coast is not so uniformly low and regular as in British and Dutch Guiana. Cayenne (q.v.), the capital of the colony, stands on a rocky promontory, and a little farther to the north-west lie the Safety Islands (Îles de Salut), behind which is the best roadstead in the colony. The undulating, heavily-timbered savannah region is crossed by one or two ranges of granite hills, nowhere exceeding 2600 feet in height. The culminating ridge, the Tumuc-Humac Mountains, only rises 1000 feet higher. The more important rivers, which all flow into the Atlantic, are the Maroni, Mana, Sinnamary, Kourou, Approuague, and Oyapock.

The commerce is almost nil, the only exports being cocoa and arnotto (roucou), each to the extent of about 750,000 lb. annually. A little coffee is grown. Gold is mined, however, and something like a value of £200,000 is annually exported; perhaps half as much again is smuggled out of the country. The total exports, exclusive of gold, have a value of some £20,000, and the imports of some £400,000. The colony costs the mother-country £250,000 a year. The population of the entire colony, exclusive of some mountain tribes, only amounted to 26,000—more than half in Cayenne—in 1895, and is slowly but surely diminishing; the marriages of people of European blood show great sterility, and infant mortality is large. The prevailing diseases of the swampy coast-lands are malarial fever, dysentery, anæmia, and yellow fever. From 1853 to 1864 an attempt was made to found penal colonies in French Guiana, all of which proved disastrous, partly owing to the unhealthiness of the climate, and partly to the harsh and ill-devised regulations in force for the management of the penitentiaries. The immigrant criminals now come (since 1864) exclusively from Africa (Arabs and negroes) and Asia (Annamites). Slavery was abolished in 1848.

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Guiana Bark, French, the bark of *Portlandia hexandra*, also called *Couteria speciosa*, a tree of the natural order Cinchonaceæ, with opposite ovate leaves, and corymbs of very large purple flowers, a native of Guiana. The bark is esteemed a very powerful febrifuge, and the value of *Warburg's Fever Drops* is believed to depend mainly upon it.

Guicciardini, Francesco, an Italian statesman and historian, was born of noble parentage at Florence in 1483. The combined studies of law and literature engrossed his attention at first; and at the age of twenty-three he was elected professor of Law at Florence, where he also practised as an advocate. But his real field was diplomacy and statesmanship, as understood at that time in Italy —the diplomacy and statesmanship of Macchiavelli. His apprenticeship served in Spain (1512–14), he became papal ruler of Modena and Reggio (from 1515) under Leo X. and Clement VII., and afterwards of Parma (1521), the Romagna (1523), and Bologna (1531). Retiring from the service of the pope in 1534, he was mainly instrumental in securing the election of Cosmo de' Medici as duke of his native city, Florence. But, being disappointed in his ambitious design of acting as mayor of the palace to this young prince, Guicciardini withdrew to Arcetri, and busied himself, till his death in 1540, with the composition of a great work, *Storia d' Italia*, a dispassionate and coldly analytical history of Italy between 1494 and 1532. This work was edited by Rosini in 10 vols. (Pisa, 1819). In 1857–67 there appeared at Florence, in 10 vols., the *Opere Inedite* of Guicciardini, containing *Ricordi Politici*, a series of aphorisms on political philosophy; *Reggimento di Firenze*, a discourse on the forms of government suited for an Italian state; and *Storia Fiorentina*. See *Edinburgh Review* (1869); and Gioda, *Guicciardini e le sue opere inedite* (Milan, 1880). His *Maxims* were translated into English by N. H. Thomson in 1890.

Guicowar (*Gaikwar* or *Gáekwár*), the designation of a powerful Mahratta prince, ruler of the state of Baroda (q.v.) in Gujarat. Piláji, who became Guicowar in 1721, by predatory excursions gradually acquired authority over Gujarat; and his son Damáji ultimately threw off his allegiance to the Peishwa. Malhar Rao, installed in 1871, was in 1873 accused of attempting to poison the British Resident, tried, and deposed. See Baroda.

Guidebooks. When in 1829 Mr John Murray began that series of travels, personal observations, and private studies which issued in 1836 in his

Handbook for Holland, Belgium, and North Germany (the first work in English to which the name of 'Handbook' was applied), there was in existence no such thing as a guidebook to Germany, France, or Spain, other than such books as Howell's *Instructions for Forreine Travell* (1642) and its successors. The only works deserving the name of guidebook were J. G. Ebel's *Anleitung* for Switzerland (Zurich, 1793; 8th ed. 1843); William Boyce's *Belgian Traveller* (1815); and Mrs Mariane Starke's *Directions for Travellers in Italy* (1820). In the long series of his guidebooks Murray had the assistance of many notable authors—of Richard Ford for Spain, Sir Gardner Wilkinson for Egypt, Sir F. Palgrave for North Italy, Dr Porter for Palestine, &c. Murray's guidebook served as the foundation for the first of Baedeker's, the German guide to Holland and Belgium, and these in their turn inspired those of Baddeley and others. Most of Baedeker's numerous guidebooks are translated into English, and are as well known as Murray's even to English travellers. Other well-known series of guidebooks are those of Appleton and A. & C. Black. For France, the most accepted authorities are the guides of Joanne; for Italy the (German) guide of Gsell Fels is admirable; for Norway Tonsberg's (in English) deserves to be mentioned. Countless guides have been written for all places of special interest both in England and the Continent. An admirable series of short practical books intended to embrace all the English counties is that of the Tourist Guides published by Edward Stanford. The most illustrious writer who has written a guidebook is Wordsworth, whose *Guide to the English Lakes*, written for Wilkinson's *Select Views* in 1810, was printed separately in 1822.

Guides, in military affairs, are usually persons drawn from the country in which an army is operating, one or more being sent with every detachment of troops. A guide should be intelligent, quick of eye, experienced in the topography of the country, and, above all, faithful. As, however, guides must on many occasions be drawn from a hostile population, and have probably only a pecuniary interest in serving well, their conduct is always watched with the utmost jealousy, death being awarded as the punishment for the least departure from trustworthiness, since treason or incompetence might involve the most disastrous consequences to the whole expedition. In the French army a considerable corps of cavalry and infantry bear the name, but the name only, of 'guides.' They were first formed in 1744 as a small company of messengers on active service. The number was gradually increased until the time of Napoleon I., who formed them into a guard 10,000 strong. In the British Indian army the corps of guides of the Punjab Frontier Force (six troops of cavalry and eight companies of infantry) have acquired the name in a similar manner.

Guidi, Carlo Alessandro, an Italian lyric poet, was born at Pavia in 1650, and died in 1712. He was one of the founders of the academy called L'Arcadia.—For another Guidi, see Masaccio.

Guido. Guido Reni, a celebrated painter of the school of Bologna, was born near that city, at Calvenzano, on 4th November 1575. He studied under Calvaert, and at the age of about twenty entered the school of the Caracci, of which he and Domenichino were the most famous pupils. He is also stated to have learned the processes of fresco from Ferrantini. His earliest works, of which the 'Coronation of the Virgin,' in the National Gallery, London, is an example, are marred by rather harsh and violent colouring; but coming under the influence of Caravaggio, he adopted many of the qualities of his art, and his following works are characterised by forcible if exaggerated chiaroscuro. About 1596 he settled in Rome, where he worked for some twenty years, adopting a graceful style, of which the famous 'Aurora and the Hours,' painted on the ceiling of the pavilion of the Rospigliosi Palace, is a typical example. This is usually regarded as the masterpiece of the artist, but some competent critics rank even higher the unfinished 'Nativity,' in the choir of San Martino at Naples. The portrait titled 'Beatrice Cenci' (q.v.) in the Barberini Palace, Rome, is ascribed to Guido on very doubtful authority. He now entered upon the third period of his art, when he painted thinly, with great ease of execution and a cold silvery delicacy of colouring; but gradually his productions lost the vigour of his earlier time, when he had been more directly inspired by nature instead of by the study of Raphael and of such examples of the antique as the Niobe group. The decline of his art is also attributable to his extravagant habits and his passion for gambling, which obliged him to paint under pressure for the dealers, and to produce much hasty and ill-considered work. On account of a quarrel with the Cardinal Spinola regarding an altarpiece commissioned for St Peter's he left Rome and settled at Bologna, where he died 18th August 1642. He was a most prolific painter, and his works are to be found in all the chief European galleries. At the beginning of the 19th century they were very highly esteemed, but now—in common with the works of other post-Raphaelite Italian masters—they are less highly valued than formerly. In addition to his paintings Guido produced some vigorous and freely-touched etchings, including a portrait of Paul V. and several religious subjects after his own paintings and those of the Caracci. He had many pupils both at Rome and Bologna. Of these the most celebrated was Simone Cantarini, known as Il Pesarese, who painted an excellent portrait of his master, now in the Bologna Gallery.

Guido Aretinus, or Guy of Arezzo, is believed to have been born near Paris in 990, and to have come to Arezzo as a Benedictine monk. He died a prior at Avellana in 1050. He greatly influenced musical studies, and almost every discovery made in music for 150 years has been attributed to him, including that of descant, counterpoint, and (absurdly enough) the spinet. It seems, however, that it was he who first adopted as names for the notes of the scale the initial syllables, set to regularly ascending tones, of the hemistichs of a hymn in honour of St John the Baptist (*ut, re, mi*, &c.). Mr Rockstro holds it certain that he invented the principle on which the construction of the stave is based, and probable that he invented the hexachord, solmisation, and the 'Harmonic or Guidonian Hand,' a mnemonic method of indicating the order of the musical sounds on the finger-joints of the left hand. The fame of Guido's musical invention drew upon him the attention of the popes Benedict VIII. and John XIX., who invited him to Rome. Guido left writings explanatory of his musical doctrines, especially the *Micrologus* and the *Antiphonarium*. See monographs by Angeloni (1811), Kiesewetter (1844), and Falchi (1882); Rockstro in the appendix to Grove's *Dictionary* (1889); and the articles Music, Solfeggio.

Guienne, one of the old French provinces, comprehending the present departments of Gironde, Lot, Dordogne, Aveyron, with portions of Tarn-et-Garonne and Lot-et-Garonne. It formed with Gascony (q.v.) what was originally the country of Aquitania (q.v.), of which name Guienne is a corruption.

Guignes, Joseph de, born at Pontoise, 19th October 1721, acquired a great reputation as an orientalist, and, chiefly on account of his thorough knowledge of Chinese, was appointed interpreter of oriental languages in the Bibliothèque du Roi. He died in Paris, 19th March 1800. His great work, *L'Histoire Générale des Huns, Turcs, Mogols, et autres Tartares occidentaux* (1756–58), is a rare example of industry and research.—His son, Chrétien-Louis-Joseph (1759–1845), was also a very distinguished oriental scholar, and published a Chinese Dictionary (1813).

Guilandina, a genus of shrubs of the natural order Leguminosæ, sub-order Cæsalpineæ. *G. bonduc* and *G. bonducella* are the best-known species. Both are natives of the warm parts of the East Indies, Arabia, Africa, and South America. Egyptian mothers string the seeds of both species and hang them round the necks of their children, to guard them from evil influences and sorcery. The latter species is also called *Nicker Tree* and *Small Bonduc*. Being about the size and shape of marbles, the seeds are often used as such by boys. The shell is remarkable for its flinty hardness. The kernel is very bitter. Ground to powder and mixed with black pepper, it is administered in India in ague; mixed also with castor-oil it is applied externally in hydrocele. The roots in Amboyna are considered to be a good tonic. The seeds are often thrown ashore on the coasts of Scotland and Ireland, and are sometimes called *Molucca Beans*.

Guildford, the county town of Surrey, lies in a break of the chalk ridge of the North Downs, on the navigable Wey, 30 miles SW. of London. In Cobbett's phrase a 'happy-looking' place, it wears an air of order and cleanliness, and mainly consists of one street, running up the steep east side of the river, which here is crossed by an old five-arch bridge. Its houses are still rich in quaint gables, projecting fronts, and long latticed windows. The square Norman keep of its royal castle (*circa* 1150) is 70 feet high with walls 10 feet thick; on St Catharine's Hill is a ruined chapel (1313); Trinity Hospital, founded in 1619 by Archbishop Abbot (q.v.) for twelve brethren and eight sisters, is a picturesque red-brick pile; and other buildings are the churches of St Nicholas, St Mary, and the Holy Trinity, the guildhall (1687), county hall (1862), county hospital (1868), and grammar-school (1509–50). A railway junction of some importance, Guildford now is chiefly famous for its grain market, the 'Surrey wheats' being celebrated. From Edward I.'s reign till 1867 it returned two members to parliament, then till 1885 one. Since 1874 it has been the seat of a bishopric suffragan to Winchester. Pop. (1851) 6740; (1891) 14,319. Bequeathed in 901 by Alfred the Great to his nephew Ethelwald, Guildford in 1036 was the scene of the decimation by King Harold's men of the Norman followers of Alfred the Atheling—a crime that led up to the Norman conquest of England. The Dauphin Louis took the castle in 1216; and in 1685 Monmouth was temporarily confined in Trinity Hospital.

Guildhall, a building in London, the place of assembly of several courts, and the scene of the civic banquets of the city corporation, was originally built in 1411, but almost wholly destroyed by the great fire of 1666. It was rebuilt in 1789 in its modern form. See London.

Guilds were associations which grew up and flourished chiefly among the commercial and industrial classes during the middle ages. The word is derived from A.S. *gild* (Dutch *gild*, Ger. *gilde*) 'a payment;' the idea of payment may therefore be assumed to be the prominent original feature of the association. The letter *u* in the English spelling of the word, it may be added, is superfluous, *gild* being the correct form. The full meaning of the word was unfolded only in the course of the history of the institution.

It is one of the many debateable points connected with the guilds, whether and how far the medieval institution was preceded and influenced by similar societies in Greek and Roman times. In the *eranoi* and *thiasoi* of the Greeks, and still more in the *collegia opificum* of the Romans, many writers find a resemblance to the guilds. The whole matter is obscure, the historical evidence being scanty and doubtful. As the ancient economy rested on slavery, and guilds were the voluntary organisation of the industrial classes, such associations could not have been very widely diffused in the ancient world, if they existed at all. The probability is that the trade corporations of the later Roman period, though very different from the guilds, may have affected the early development of the latter. But the real origin of the guilds must be sought in the needs and circumstances of the time when they flourished.

The guilds known to history were an organisation of the commercial and industrial classes, determined by the economic, social, and political conditions prevalent during the middle ages. The most important of these conditions were the growth of freedom in the towns as opposed to the slavery of older times and the still existing serfdom of the country, the prevalence of a small industry operating for the most part in strictly defined local limits, and the absence of strong central governments. They were free local associations of the industrial classes for the promotion of their common interests at a time when central governments did not exist or were too weak to perform all the functions of government as now recognised.

As the cities, and the free life associated with them, arose but slowly in the Teutonic settlements after the wreck of the Roman empire, the guilds had at first a very gradual growth. The first mention of an institution so called occurs in England in the laws of Ina (7th century) and Alfred. We hear of it first on the Continent in the time of Charlemagne in 779. By the middle of the 9th century guilds were widely diffused throughout the Frankish empire. In the 11th century they began extensively to flourish in the countries settled by the Teutonic peoples; and they were powerful also in France and Italy, where the Teutonic influence had been only partially felt. In the 14th and 15th centuries the institution reached its culminating point.

Guilds were an historical institution varying with the times and with the needs and aims of their members; and it would therefore be misleading to attach too definite a meaning to the word. In some of them doubtless the distinctive features were periodic festivals defrayed by the contributions of the members. These were the social guilds. As during the middle ages the distinction between religious and secular was not so strongly marked as now, all the guilds had more or less of a religious cast. Many of them, however, had a distinctly and exclusively religious purpose, and are therefore specially called religious guilds. But the earliest great example of the historic guild was the *gilda mercatoria* or *gild merchant*. In the evolution of town life during the middle ages the commercial class was the first to assert itself. It does not fall within the scope of this article to explain the conditions under which the medieval towns arose; and we need hardly state that as the towns grew, the necessity for intercourse among themselves and with the surrounding country regions was soon felt. Within

the towns the advance of civilisation brought with it a multitude of crafts, the workmen in which organised themselves into the *craft guilds*. In many cases the guild organisation was identical with or grew into the government of the towns. But as the merchant guilds were first in the field, and moreover as the great merchants were frequently also the local landholders, the merchant guilds claimed and for a long time maintained a privileged position. Hence fierce and bitter struggles between the merchant and craft guilds, which after continuing for many generations ended on the whole in favour of the latter towards the end of the 14th century.

From what has been said it will be evident that the guilds had a far wider scope than the trades-unions of the present time. The distinction between labour and capital did not then exist; the guilds were an organisation of the whole industrial class, and they were associated with the business of local and civic self-government in the widest sense of the word. They were most powerful on the Continent, especially in the towns of Flanders and south Germany, where the civic life was strongest and the central government particularly weak; there the guild struggles, especially the struggle of the craft against the merchant guilds, were fought out most vigorously. In England, where after the Norman Conquest there had been a comparatively strong central power, the guilds found less scope for independent activity in that way.

The inner organisation of the guilds rested on the arrangement of the workers into master, journeyman, and apprentice. The right to the independent exercise of a trade depended on being member of a guild, and guild membership carried with it the privileges of citizenship. On the one hand, the guild had its own particular branch of industry reserved to it and a local market for its produce secured; on the other hand, the guild had to see that its members possessed the due qualifications, moral and technical, and that the work they turned out was of fair and reasonable quality. In other words the interests of producers and consumers were supposed to be reconciled on equitable terms. Those objects could be attained, and the guild organisation generally could be maintained only by a system of regulations, which were often very minute, and yet were not sufficient to prevent continual disputes between the various crafts. On the whole the guild organisation was best adapted to a stable condition of industry and of society.

The causes of the decline and fall of guilds have not yet been thoroughly investigated, but the main reason may be found in the fact that they became stagnant and did not adapt themselves to the conditions of modern progress. As they had grown up and flourished under medieval conditions, so they began to decay under the new influences which overthrew the medieval system. Under the centralised governments which rose on the ruins of feudalism, and during the great wars waged by them in the 16th and 17th centuries, the free civic life of Flanders and Germany was crushed out. In England the central power represented by Henry VIII. gave a severe blow to the guilds by confiscating their property on the plea that it was used for purposes of superstition; only the London corporations redeemed their funds by paying a fine of £18,700. The mercantile system was best adapted to such governments, and the guild organisation had to conform to the new system. Strong governments like France and Prussia regulated the guild organisation in the interest of the central power as then understood, the result being to deprive the members of free initiative and to make their constitution more rigid than ever. Above all, it was the great industry of more recent times which finally broke up and superseded the guild industry. This may be best illustrated by the early history of the steam-engine, which was at once the originating cause and the embodiment of the industrial revolution that made guilds a thing of the past. Because of the opposition of the trade-guilds of Glasgow, James Watt could pursue his experiments only within the limits of the university there. The skill, energy, and enterprise which produced the first effective steam-engine under Watt's initiative, were found at Birmingham, a town where trade corporations did not exist. These facts are typical of the whole movement. Guild restrictions, whether imposed by themselves or by strong central authority, were not consistent with the new industry, for which freedom was a prime necessity. This was at length recognised in the legislation of the most advanced countries of Europe. After a partially successful attempt by Turgot in 1776, trade corporations were entirely abolished in France at the revolution of 1789. All special industrial privileges enjoyed by guilds or corporations in England were removed by the municipal Reform Act of 1835. The North German Industrial Code of 1869 had the same effect in Germany. Thus the guild organisation, which during the middle ages realised the ideals of freedom, progress, and equity in such measure as was attainable by the men of that time, had become opposed to the wider claims of freedom, progress, and equity as now understood, and had to be swept away.

The name of guild has recently been revived in connection with associations for various social purposes, self-improvement, &c. These we need not say are entirely different from the old guilds, to which this name were better restricted. The co-operative society is the only institution existing in the western world that really corresponds to the historic guild. The London livery companies still continue, but they have lost the substantial characteristics of the organisations of which they are a survival and relic. Recent investigation, however, has shown that guilds have long flourished very extensively in China. The castes of India in many respects perform the same functions, industrial and social, as the medieval guild.

See the articles CO-OPERATION, TRADES-UNIONS, CITY, CORPORATION, HANSEATIC LEAGUE, &c. The whole subject of guilds has not yet been sufficiently investigated, and in some important cases the materials for such investigation no longer exist. Most of the documents relating to the guilds of Paris, for example, were destroyed during the revolutionary period of 1789. See L. Brentano, *On the History and Development of Gilds*, first published as preface to *English Gilds* by Lucy Toulmin Smith (1870), and appearing later as introduction to the same writer's *Arbeitergilden der Gegenwart* (1871); Ochenowski, *England's Wirthschaftliche Entwickelung im Ausgang des Mittelalters* (1879); Dr C. Gross, *The Gild Merchant: a Contribution to English Municipal History* (2 vols 1890); article 'Gewerbe,' by G. Schonberg, in Schonberg's *Handbook of Political Economy* (2d ed. 1886); E. Bain, *Merchant and Craft Guilds of Aberdeen* (1887); and Walford, *Gilds: their Origin and Constitution* (2d ed. 1889). For the earlier period of English guilds, W. J. Ashley's *Introduction to English Economic History and Theory* (1888) may be particularly recommended.

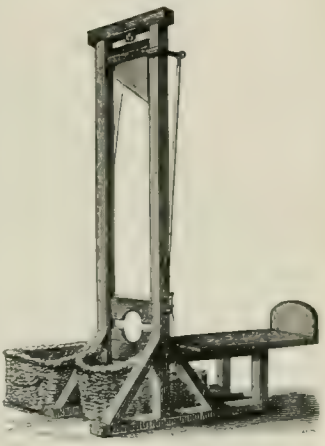
Guillemin, AMADÉE VICTOR, a popular writer on science, was born in Saône-et-Loire, 5th July 1826, and became a professor of Mathematics at Paris. Of his numerous illustrated works many have been translated into English, including *The Heavens* (1866), *The Sun* (1869), *The World of Comets* (1876), and *The Forces of Nature* (1872) and *Application of Physical Forces* (1877), the last two by Mrs Norman Lockyer. Both in France and England Guillemin's works have gone through many editions. He died 2d January 1893.

Guillemot (*Uria*), a genus of diving birds of the Auk family (Alcidæ), represented by eight species in the arctic and north temperate zones. The bill is moderately long, straight, and feathered to the nostrils; the feet are three-toed, the hind-toe being absent, and they are completely webbed. The wings and tail are short, and the legs are placed very far back, so that the bird stands erect. Its walk is awkward, and its flight heavy though well sustained; but it dives with great agility, using its half-opened wings to aid its progress. The guillemots breed in large colonies on rocky cliffs, building no nests, but laying their eggs on the bare rock, and the male shares with the female the labour of hatching and rearing the young. Their food consists of crustaceans and small fishes. The Common or, as it is often called, Foolish Guillemot (*U. troile*), is very abundant on the British coasts. In summer the head, neck, and upper parts of the body are of a dark brown, the under parts white, the bill, legs, and feet black; in winter the neck and some parts of the head are white or mottled brown and white. The male measures about 18 inches in length; the female is coloured like the male, but is slightly smaller. She lays only one egg, 3 inches in length, which she hatches by holding it between her legs as she sits erect facing the cliff. The eggs are pear-shaped, and vary in colour from pale green to a deep reddish-brown. It seems, however, as if one bird laid the same colour of egg in successive seasons. The Ringed Guillemot is sometimes considered as a distinct species (*U. ringvia*), but as it differs from the common guillemot only in having round the eyes a ring of white continued backwards as a fine line, and as it is never found except where the latter also occurs, most ornithologists now agree in regarding it as a variety. The Black Guillemot (*U. grylle*)—sometimes placed in a separate genus (Cepphus)—is found in Caithness and on the west coast of Scotland, and is fairly abundant in the Hebrides, Orkney, and Shetland. It is smaller than the preceding species, its length being only 14 inches, and it differs from it in laying two eggs. Its summer plumage is sooty-black, with the exception of white patches on the wing-coverts; and in winter the head and back have white markings, and the under parts are nearly white. In America *U. grylle* breeds as far south as the Bay of Fundy; *U. troile* is occasionally found on the coasts of New York. Where guillemots congregate in vast numbers, as at Flamborough Head, scaling the cliffs in search of their eggs is a regular profession, and one which requires much skill and courage. The eggs are occasionally used as food, as is also, indeed, the coarse flesh of the bird itself; but they are chiefly valued for their albumen, of which it is said large quantities are used in clarifying wine and in the preparation of patent leather. See Howard Saunders, *Manual of British Birds*.

Common Guillemot (*Uria troile*).

Guillim, John, heraldic writer, born in Herefordshire, about 1565, was most of his life an official of the College of Arms in London. In 1610 he published *The Display of Heraldry*, the materials for which, however, were supplied by John Barkham (*c.* 1572–1642), chaplain to the Archbishop of Canterbury. Guillim died 7th May 1621.

Guillotine, the instrument of decapitation introduced during the French Revolution by the Convention, and named after its supposed inventor, Joseph Ignace Guillotin, a physician (born 1738—died in his bed, not, as often said, by his own instrument, 1814), who, however, was only the person who first proposed its adoption. It was erected and first employed to execute a highwayman on the Place de Grève, Paris, 25th April 1792. It is composed of two upright posts, grooved on the inside, and connected at the top by a cross-beam. In these grooves a sharp iron blade, having its edge cut obliquely, descends by its own weight on the neck of the victim, who is bound to a board laid below. The invention of machines of this kind is ascribed to the Persians. In Italy, from the 13th century, it was the privilege of the nobles to be put to death by a machine of this kind, which was called *mannaia*. An instrument resembling the guillotine was likewise employed during the middle ages in Germany, where it has been reintroduced since 1853, and at a later date in France and Holland. During the 16th and 17th centuries a machine called the *Maiden*, which differed but slightly from the guillotine, was employed in Scotland for the purpose of decapitation; among its victims were one of Rizzio's murderers (1566), the Regent Morton (1581), and the Marquis (1661) and the Earl of Argyll (1685). Morton is commonly, but falsely, said to have introduced it, taking the idea from the similar engine at Halifax (q.v.), which was in use till 1650. See J. W. Croker, *History of the Guillotine* (1853); L'Abbé Bloeme, *Notice sur la Guillotine* (1865); Chereau, *Guillotin et la Guillotine* (1871); and Dubois, *Récherches historiques et physiologiques sur la Guillotine* (1881).—The name of guillotine is also given to a powerful machine used by bookbinders for cutting paper and cropping the edges of books, the blade having an oblique motion.



Guillotine.

Guilty. See Criminal Law.

Guimarães, an ancient and picturesque walled town of Portugal, on the Ave, 12 miles SE. of Braga. Here is the 14th-century Oliveira Church, and there are two noted hot sulphur-springs in the vicinity. Pop. about 8205.

Guinea, the name of a large section of the west coast of Africa, which first came into general use in the 15th century. Although the name is used with a different extension by different writers, it is pretty generally agreed that the stretch of coast-lands so designated extends from the mouth of the Senegal, in about 14° N. lat., to Cape Negro, in 16° S. lat. By conventional usage it is further divided into two parts, Upper and Lower Guinea, the dividing line being taken variously as the equator, the Gaboon, the Ogoway. The states and political territories comprised within this long

stretch of coast-line, commencing from the north, are as follows: the French colony of Senegal, the English settlements on the Gambia, the Portuguese territory of Bissáo or Bissajos, the coastal fringe before Futa-Jallon, Sierra Leone (British), the free negro republic of Liberia, the Ivory and Gold Coasts (shared between France and Britain), the Slave Coast (belonging to Germany, Britain, and France), the Niger delta (falling within the British sphere of commercial interest), and the Cameroons (German) in Upper Guinea; and in Lower Guinea, the Spanish settlements on Corisco Bay, the French colony of the Gaboon, the Congo Free State, and the Portuguese territories of Ambriz, Angola, and Benguela. The coast line is throughout tolerably uniform, and everywhere flat, with numerous shallow lagoons separated from the ocean by narrow spits of sand, lying parallel to the coast. Proceeding inland, the country rises to the central plateau of the continent by a series of broad terrace like steps, down which the longer rivers are generally precipitated in cataracts and rapids. The Genoese claim to have reached the coasts of Guinea in 1291. They were regularly visited by merchants from Rouen and Dieppe from 1364, but were not colonised until the Portuguese, under Henry the Navigator, sent out colonies hither (1481). The vast indentation of the Atlantic lying between Upper and Lower Guinea is called the Gulf of Guinea. Of late it is usual to restrict the name of Guinea to Upper Guinea, in which there are three ethnological groups: (1) Tshi-speaking tribes, the most barbarous, including the Ashantees; (2) Ehwe-speaking, including the Dahomeyans; (3) Yoruba-speaking, including the Egbas and other relatively civilised peoples. French influence has been greatly developed in Guinea of late, both on the coast and in the Hinterland. French Guinea, without Futa Jallon, the Ivory Coast, or Dahomey, includes Grand Bassam, Assinie, Grand Lahou, and Jackeville on the Gold Coast; and Porto Novo, Grand Popo, Kotonou, and Agoué on the Bight of Benin. See separate articles on GOLD COAST, &c.

Guinea, a gold coin current in Great Britain from 1664 down to 1817, when it was superseded by the Sovereign (q.v.), was at first coined out of gold from the Guinea coast. It was designed to be of the value of twenty shillings, and as legal tender it had no higher value till 1718. But its actual value

Guinea of Charles II.

varied. Thus in 1695 it was as high as thirty shillings, in 1697 twenty-two shillings, thereafter till 1717 twenty-one and sixpence, but was finally fixed at twenty-one shillings. It is still customary in Great Britain to estimate professional fees, honoraria of all kinds, complimentary subscriptions, prices of pictures, race-horses, &c. in guineas. In 'spade guineas' the reverse bears a spade-shaped shield with the royal arms.

Guinea Corn, a name sometimes given to Durra (q.v.); sometimes to a Millet (q.v.).

Guinea Fowl (*Numida*), a genus of African birds in the Pheasant family (Phasianidæ). The plumage is dark gray, with round spots of white, generally larger on the back and under surface. Some species are adorned on the head with a helmet or horny casque, while others have fleshy wattles on the cheeks and a tuft or top-knot on the crown. The genus is represented by nine species, in the Ethiopian region—east to Madagascar, south to Natal. The best known is the Common Guinea Fowl or Pintado (*N. meleagris*), also popularly

Common Guinea Fowl (*Numida meleagris*).

known as 'Come-back,' from its cry, with naked head, hard callous casque, and slate-coloured plumage, everywhere speckled with round white spots of various sizes. It is common in Guinea and southwards to the Cape of Good Hope. It is found also in more northern parts of Africa, and was known to the ancient Romans, by whom it was called *Meleagris* and *Gallina Numidica*, and highly prized. In their wild state the birds occur in flocks, sometimes of fifty to sixty, and are extremely shy and difficult to approach. They utter a frequent, harsh, and querulous cry. They are not so polygamous as many of the gallinaceous birds, and even in domestication show a tendency to pair. The guinea fowl is now common in the poultry-yards of most parts of Europe, although it is more adapted to warm than to cold climates, and in Jamaica has been completely naturalised, so as to be destructive to crops and to be shot like other game. In Britain the young are rather troublesome to rear, but both birds and eggs command high prices in the market. The eggs are small, and have a thick, strong shell, but are particularly esteemed. The flesh is somewhat like a pheasant's, but rather dry. Guinea fowls, however, are troublesome in a poultry-yard, from the disposition of the males to attack and tyrannise over other poultry.

Guinea Grass (*Panicum maximum*), a grass of the same genus with Millet (q.v.), a native of Guinea and Senegal, but introduced at an early period to the West Indies, where it is extensively cultivated, and by the abundance and excellence of its forage forms most important pasture. Other species of the same genus are among the most useful pasture and forage grasses of tropical countries.

Guinea Pepper, a name which has been variously applied to the seeds or dried fruit of several very different plants, agreeing in their peppery character, and in being the produce of the west of Africa. The name Malaguetta (Malagheta, Meleguetta, &c.) Pepper is generally to be regarded as equivalent with Guinea Pepper, and is at present a frequent designation of Grains of Paradise (q.v.); but the capsules or dry berries of *Capsicum frutescens* (see CAPSICUM) are commonly but erroneously

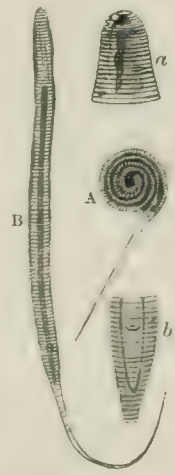
sold by druggists under the name Guinea Pepper; whilst the names Guinea Pepper, Malaguetta Pepper, and Ethiopian Pepper have been applied to the dried fruit of *Cubeba Clusii* (see CUBEBS), and to the seeds of *Habzelia* (or *Xylopia*) *Æthiopica*, a shrub of the natural order Anonaceæ. Up to the close of the 18th century Guinea Pepper continued in request, when the peppers of the East drove it from the market.

Guinea-pig, or CAVY (*Caria*), a genus of small South American rodents, widely represented in Britain by the familiar domesticated species. The genus, comprising nine species, is typical of the family Caviidæ (included in the porcupine-like section of Rodents), and is nearly related to the largest member of the order—the Capybara or Hydrochœrus. The guinea-pigs have short limbs, the fore-feet bearing four toes, the hind-feet only three; the fore-feet are not webbed; the upper lip is not cleft, the ears are short and rounded, and the tails are wanting. The Common Guinea-pig or Cavy (*C. cobaya*)—whose name Guinea is believed to be a corruption of Guiana—was introduced into Europe from South America in the 16th century. Its supposed wild original, the Restless Cavy (*C. aperea*), abounds on the banks of the La Plata,

Guinea-pig.

and is found in Bolivia and Brazil. Its colour is dark brown on the back and yellowish-gray underneath. It lives in small troops near the borders of forests, whence it emerges at dusk and on gloomy days in search of food. It is timid and stupid, and falls an easy prey to carnivores and serpents. The common guinea-pig resembles it closely in nearly all points except colour, which is very variable, as in other domesticated animals. The guinea-pig multiplies with great rapidity, and may begin to bear young when two months old, producing one to four at a birth, five or six times a year. The other species occur from the Strait of Magellan to Brazil, and one is found in Peru. Although now exclusively South American, fossil forms are said to have been found in the Miocene deposits of Switzerland and France. Some species of Cavia are shot for food, but no such use is made of the domesticated form.

Guinea-worm, known also as *Filaria Medinensis*, or *F. Dracunculus*, is a parasitic animal that seems to have been known from the earliest times. Plutarch quotes a passage from a still earlier author which seems clearly to refer to this worm. But our knowledge of its natural history is still very deficient, and we are at present only acquainted with the female. The body of this animal is slender, cylindrical, and somewhat compressed, and is of the thickness of pack-thread, except at the posterior extremity, where it is somewhat attenuated. It is opaque, of a milk-white colour; on each side there is a longitudinal line; and when examined by the microscope it is seen to be marked with numerous transverse striæ. The anterior extremity is obtuse and the mouth circular and beset with four acute spines. The length of the worm varies from less than half a foot to three yards. On examining an adult specimen, extracted by Malgaigne in Paris in 1854, Robin found no trace of intestine, or of any organ except a very thin sheath (a uterus or oviduct), which was filled with young animals rolled up in coils, with the tail occasionally projecting outwards (see A in the figure). In these young animals we can trace the course of the intestinal canal, which apparently becomes subsequently obliterated by the excessive development of the generative organs and the eggs.



Young Filaria Medinensis (magnified):

A, individual coiled up, as seen in the body of its parent; B, the same uncoiled in a drop of water: *a*, the head; *b*, the commencement of the tail and the anus.

This worm is indigenous only in certain hot countries, and its geographical distribution is regulated by laws into which we have no insight, save that heat and moisture are necessary for its production. Among places as especially notorious for its occurrence are Senegal, Gaboon, the banks of the Ganges, Bombay, the peninsula of India, Persia, Arabia Petræa, the south coast of the Red Sea, the region round the Caspian Sea, Upper Egypt, Abyssinia, certain districts of Nubia, the swampy regions of the White Nile, and Guinea. It has been introduced into certain parts of America by negro slaves. The disorder occasioned by these worms frequently becomes an epidemic in years of heavy rain, and especially in marshy districts. It appears also to be connected with the season, being especially prevalent in the East Indies during the rainy season, and in Upper Egypt shortly after the regular inundation of the Nile.

The mode of production of this parasite in the human body is not known with certainty. The probability is that the young animals while still very minute penetrate the skin, although by what mechanism they can effect their lodgment we do not know. Having gained an entrance into the body, the guinea-worm takes a considerable time to develop. This period varies from two months to a year or even two years. The presence of the worm often produces no annoyance for a considerable time after it has been detected; at other times it gives rise to emaciation, and possibly even death from exhaustion. As a general rule the vesicles caused by the inflammation excited by the presence of the worm open spontaneously in a few days, and two or three inches of the anterior end of the animal come forth. This end is gently pulled, and coiled round a little roll of linen or a small stick, and this is fastened over the wound with sticking-plaster and a compress. The extraction is repeated twice a day by rotating the substance round which the worm is twisted, and the operation is often not completed in less than two, three, or more months. From the most ancient times the tearing of the worm has been regarded as a very dangerous accident. It undoubtedly gives rise to violent swelling, fever, sleeplessness; and shortening and deformities of the legs, lingering fistula, mortification, and death (sometimes even sudden death) must be reckoned amongst the notable consequences of breaking the worm. See Quain's *Dictionary of Medicine*;

Linn. Trans. (1863); also the writings of Owen, Cobbold, and Bastian.

Guinegate, a village of Hainault, Belgium, where the French were twice defeated. (1) On 17th August 1479 they were beaten by Maximilian I. of Austria; (2) on 16th August 1513 by Henry VIII. and the Emperor Maximilian. This battle was called the Battle of the Spurs—the French knights having made more use of their spurs than of their swords.

Guines, formerly GUISNES, a small town (pop. 3800) 8 miles S. of Calais, was the scene of 'the Field of the Cloth of Gold' (see HENRY VIII.).

Guinevere. See ARTHUR.

Guingamp, a French town in Côtes-du-Nord, on the Trieux, 74 miles E. of Brest, was formerly the capital of the duchy of Penthièvre. Hence the word *Gingham* (q.v.). Pop. 8744.

Guinness, SIR BENJAMIN LEE, Bart. (1798–1868), was a member of the great brewing firm in Dublin established by Arthur Guinness in 1759. The business, the largest in the world, was made a limited liability company in 1886, with a capital of £6,000,000, employs nearly 3000 persons, and its premises cover 42 acres. Sir Benjamin, M.P. for Dublin in 1865–68, and a baronet from 1867, restored St Patrick's cathedral at his own cost (£140,000). His eldest son, Arthur Edward, became Lord Ardilaun in 1880. His third son, EDWARD CECIL, born 10th November 1847, created a baronet in 1885 and a peer (Baron Iveagh) in 1891, placed in the hands of responsible trustees in 1889 the sum of £250,000, to be spent in providing sanitary dwellings for workmen at a low rent, £200,000 to be given to London and the rest to Dublin. The income derived from the use of the capital sum is to be devoted to the same purpose.

Guipuzcoa, the smallest but the most densely peopled of the Basque provinces on the Bay of Biscay. The mountains are wooded, the climate good, minerals are largely produced, and there is a good deal of manufacturing industry—soap, pianos, carriages, carpets, iron, paper. The capital is San Sebastian. Area, 728 sq. m.; pop. (1887) 181,856. For the people, see BASQUES.

Guisborough, a market-town of the North Riding of Yorkshire, 9 miles by rail ESE. of Middlesborough, lies at the foot of the Cleveland Hills, in the midst of the iron-mining district. The earliest alum-works in England were established here about the year 1600. Here too are the remains of a priory built in 1119 by Robert de Brus, and at the time of the Reformation one of the wealthiest monastic institutions in the kingdom. Pop. (1851) 2062; (1881) 6616; (1891) 5623.

Guiscard, ROBERT, Duke of Apulia and Calabria, the sixth of the twelve sons of Tancred de Hauteville, was born near Coutances in Normandy about 1015. Following in the wake of his elder brothers, he won great renown in south Italy as a soldier, and after the death of William and Humphrey was proclaimed Count of Apulia. Guiscard next captured Reggio and Cosenza (1060), and thus conquered Calabria, in the possession of which he was confirmed by Pope Nicholas II. Robert now became the pope's champion, and along with his younger brother Roger waged incessant war against Greeks and Saracens in south Italy and Sicily, both of which gradually fell under their arms, the latter being, however, given to Roger as count. The closing years of Robert's life were occupied in fighting against Alexius Comnenus, who had deposed Michael VII. from the throne of Constantinople, Robert being drawn into the quarrel from the fact that he had married his daughter to Michael's heir. Having sent his son Bohemond (q.v.) to reduce Corfu, he himself gained a brilliant victory over Alexius at Durazzo (1081), captured that city (1082), and then marched through Epirus towards Constantinople, when he received information that the Emperor Henry IV. had made an inroad into Italy. He immediately hastened back, compelled Henry to retreat, and liberated the pope, who was besieged in the castle of St Angelo (1084). Then, having returned to Epirus, he defeated the Greeks in several engagements, took possession of some islands in the Archipelago, and was on the point of advancing a second time to Constantinople, when he died suddenly in Cephalonia, 17th July 1085. See works on the Normans in Europe by A. H. Johnson (1877) and T. W. Barlow (1886).

Guise, a town of the French department of Aisne, on the Oise, 25 miles by rail ENE. of St Quentin. Within the town are the ruins of a castle, from which the famous Dukes of Guise derived their title. Guise is now a place of considerable industrial activity, with woollen and cotton manufactures, and a large foundry (800 hands) for manufacturing cooking and heating stoves. The ironworks are conducted on a profit-sharing scheme; and the workmen are provided with dwellings on the associated plan. This *Familistère*, of which the first portion was erected by the initiator of the experiment, M. Godin, in 1859–60, has cost about £80,000, and provides accommodation for 2000 persons. Within the buildings are a café, theatre, nursery, schools, covered playgrounds, a co-operative store, and a library and reading-room. Pop. (1872) 5651; (1891) 8153.

Guise, the name of a branch of the ducal family of Lorraine, which it derives from the town of Guise, in the department of Aisne.

CLAUDE OF LORRAINE, first Duke of Guise, was the fifth son of René II., Duke of Lorraine, and was born at the château of Condé, October 20, 1496. Attaching himself to Francis I., he fought with distinction at Marignano in 1515; but after that campaign remained at home to defend France against the English and Germans (1522–23). During the captivity of Francis I., after Pavia, Claude of Guise suppressed the peasant revolt in Lorraine (1527), for which Francis, after his return home, created him Duke of Guise. In his later years he held himself aloof from public life; he died 12th April 1550.

His daughter Mary, usually spoken of in history as Mary of Lorraine, was born November 22, 1515, and in 1538 became the wife of James V. of Scotland. By his death in 1542, she was left a widow with one child, Mary, Queen of Scots. Under the regency of Arran which followed, war broke out between England and Scotland, partly on account of the claims which Henry VIII. made with regard to the infant Mary's marriage, and partly on religious grounds. Mary of Lorraine during those years acted with much wisdom and moderation; but after her own accession to the regency in 1554, she allowed the Guises too much to influence her policy, the result being that the Protestant nobles combined against her in 1559. This rebellion, which she was assisted by French troops to repress, continued almost to the time of her death, which took place in Edinburgh Castle, 10th June 1560. But before her death she was reconciled to her nobles.

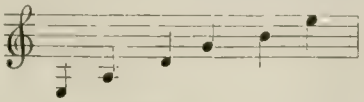
FRANCIS, second Duke of Guise, son of the first duke, was born at Bar, February 17, 1519, and became one of the greatest generals of France. At the siege of Boulogne (1545) he gained the nickname of Balafré from a severe wound in his face. Seven years later he held Metz gloriously against Charles V. of Germany, and thus prevented an invasion of France. He added to his reputation at Renti (1554), fighting against the troops of Charles

V., and in 1556 took command of the expedition against Naples. Recalled thence in the following year to defend the northern frontier against the English, he took Calais (1558) and other towns, and brought about the treaty of Cateau Cambrésis (1559). He and his brother Charles, the cardinal (1525–74), probably the most capable man of the Guises, who afterwards played a prominent part at the Council of Trent, then managed to possess themselves of all real power during the reign of the weak King Francis II. Putting themselves at the head of the Roman Catholic opposition to the Reformation, they repressed Protestantism with a strong arm. In the war between Huguenots and Catholics Guise and Montmorency won a victory at Dreux (1562), and the former was besieging Orleans when he was assassinated by a Huguenot nobleman, on 18th February 1563. He had a taste for literature, and his memoirs, written by himself, have much historic interest. See his Life by Brisset (1840) and Cauvin (1885).

Henry I., third Duke of Guise, son of Francis, was born December 31, 1550. Filled by the murder of his father with bitter hatred of the Protestants, he fought fiercely against them, at Jarnac (March 1569) and Moncontour (October 1569), and in the same year forced Coligny to raise the siege of Poitiers. He was one of the contrivers of the massacre of St Bartholomew, August 24, 1572, in which he personally made sure that Coligny should be slain; and subsequently he put himself at the head of the Catholic League. He had, however, a greater ambition, that of succeeding to the throne of France, for in respect of real power he was already the equal, or rather superior, of the feeble King Henry III., whose commands he set at nought and whom he so deeply humiliated that the king procured his assassination, on 23d December 1588, at Blois. This duke earned the nickname of Le Balafré ('of the scar') in an encounter with German mercenaries of Condé at Dormans (1575). See his Life by Rénauld (1879).

Henry II., fifth Duke of Guise, the grandson of Henry I., was born at Blois, April 4, 1614. He was destined for the church, and at the age of fifteen became Archbishop of Rheims, but, in 1640, on the death of his elder brother, he succeeded to the dukedom. Having joined the league against Richelieu, he was condemned by the parliament of Paris to capital punishment, but found refuge in Flanders. He put himself at the head of Masaniello's revolt in Naples, as the representative of the Anjou family, but was taken prisoner by the Spanish forces (1647) and carried to Madrid, where he remained five years. After another fruitless attempt to win Naples (1654), he settled at Paris and lived the life of a courtier, dying in June 1664 without descendants. His *Mémoires* (2 vols. Paris, 1669) were written partly by Count Raymond of Modena and partly by his secretary, St Yon. The direct line of the house became extinct on the death of François Joseph (1675), the seventh duke, and grandson of Henry II.'s brother Louis. See Forneron, *Les Ducs de Guise* (2d ed. 1893).

Guitar (Lat. *cithara*, Gr. *kithara*, 'a lyre or lute'), a musical stringed instrument, somewhat like the lute, particularly well adapted for accompanying the human voice, and much esteemed in Spain and Italy. It was first introduced into the former country from the East by the Moors. It has six strings, the notation of which is as follows:



but which sound an octave lower; and the sound is produced by the fingers of the right hand twitching the strings, while the fingers of the left hand make the notes of the music on the finger-board, which has frets across it. The three highest strings of the guitar are always of gut, and the three lowest are of silk spun over with silvered wire. The greatest virtuosi on the guitar have been Giuliani, Sor, Zoechi, Stoll, and Horetzsky.

Guizot, François Pierre Guillaume, historian and statesman, was born at Nîmes, October 4, 1787, of middle-class Huguenot parentage. His father, although a Liberal, was guillotined, April 8, 1794, whereupon his mother removed with him to Geneva. There he was carefully educated, being taught among other things the trade of a carpenter, in accordance probably with Rousseau's theories. In 1805 he went to Paris to study law. He soon drifted into literature; and it was a review of Chateaubriand's *Martyrs* (1809) that brought him under the notice of the dictator of Parisian literary society. In the same year appeared Guizot's *Nouveau Dictionnaire des Synonymes*, in 1811 an essay on the fine arts; and in 1812 the final literary bent of his mind showed itself in a translation of Gibbon. That same year he married the first of his three wives, Mdlle. de Meulan (1773–1827), editor of *Le Publiciste*, to which he had been a contributor. Shortly afterwards he was chosen professor of Modern History in the University of France. Guizot was, however, a decided opponent of the Napoleonic *régime*, and it was not till 1814, after its fall, that he became secretary-general of the ministry of the Interior. This office he exchanged after the Hundred Days for the secretary-generalship of the ministry of Justice, and in 1816 for the general directorship of the departmental and communal administration, being at the same time made a councillor of state. As a *doctrinaire* or constitutional Liberal, he found himself out of sympathy with the reactionary policy of the Bourbons. So pronounced was his opposition that in 1821 he was deprived of his public appointments, and four years later interdicted even from lecturing on history. He threw himself once again into literature. In conjunction with some friends he published *Mémoires relatifs à l'Histoire de France jusqu'au 13me Siècle* (31 vols.), and *Mémoires relatifs à la Révolution d'Angleterre* (26 vols.). He also edited translations of Shakespeare and Hallam, and commenced his *Histoire de la Révolution d'Angleterre*. Having in 1828 been restored to his chair, he lectured on the history of civilisation in Europe, and more particularly in France. These lectures, published as *Cours d'Histoire Moderne*, finally established his reputation as one of the first historians of his day.

The time had now come for Guizot to take a more active part in politics. In 1830 he was returned to the Chamber of Deputies for Lisieux, at once became a prominent member of the Opposition, and, although no orator, aided indirectly in bringing about the Revolution of July, which placed Louis-Philippe on the throne. Minister first of the Interior, and subsequently of Public Instruction, he signalised his occupancy of the latter congenial office by establishing a system of primary schools throughout France, giving an impulse to secondary and university education, and reviving the Académie des Sciences Morales et Politiques. In 1840 Guizot, then temporarily in alliance with his leading parliamentary rival, Thiers, came to London as French ambassador, and was received with great respect, on account of his reputation and the interest he had shown in English history. But, unfortunately, at this time the relations between Great Britain and France were strained in consequence of the Syrian question, and Guizot was, not quite accurately, looked upon by Melbourne

and Palmerston as the mouth piece of the policy of Thiers. 'He was always,' in Melbourne's opinion, says Melbourne's biographer, 'what Talleyrand from the first pronounced him to be—*un intrigant austere*.' Fortunately for Guizot he did not hold the embassy long. Thiers's belligerent policy alarmed Louis Philippe into virtually dismissing him. Guizot was summoned to take his place, and till the end of Louis-Philippe's reign was his chief adviser, although it was not till 1847 that he became prime minister. In the early years of his term of power Guizot was undoubtedly successful; his chief aim, like his master's, peace.

When, after the fall of Peel, Palmerston once more obtained the control of British foreign policy, Guizot, by way of checkmating him, plunged into the intrigue which resulted in the 'Spanish Marriages.' This intrigue was totally indefensible, and the indecency of the central incident in it—the forcing of the young queen of Spain into a marriage with a disreputable and intellectually contemptible kinsman—revolted the conscience of Europe, and greatly injured Guizot's reputation. It alienated France from Great Britain, and compelled Guizot to fall back for sympathy on the reactionary forces in Europe, whose hope at this time was Austria. He also relapsed into reactionary methods of government at home, allowed the finances to drift into confusion, and resisted the rising demand for parliamentary reform; whilst, although personally pure, his administration became notorious for scandalous jobs.

With the fall of Louis-Philippe in February 1848 Guizot's active political career really came to an end. He escaped to London, where he was cordially received by old friends, and even by old opponents like Palmerston. In the troubled period which preceded the establishment of the second empire Guizot made efforts both in London and Paris to rally and fuse the monarchical parties of France, but after the *coup d'état* of December 2, 1851, he gave himself up entirely to literature. He completed his works on the Great Rebellion in England, under the titles of *Révolution d'Angleterre* and *Monk, Chute de la République*. He also published *Corneille et son Temps*, and *Shakspeare et son Temps* in 1852; *Mémoires pour servir a l'Histoire de mon Temps*—an explanation of, but certainly not an apology for his policy—in 1858; *Mélanges Biographiques et Littéraires* in 1868; and *Mélanges Politiques et Historiques* in 1869. His *Vie, Correspondance, et Ecrits de Washington* (1839–40) was commissioned by the United States government. Guizot took a keen interest in theological and ethical speculation, and for a long time his voice was supreme in the consistory of the Protestant church in Paris. His excursions into other fields than those of history and politics bore fruit in *Méditations et Études Morales* (1852), and *Méditations sur l'État actuel de la Religion Chrétienne* (1865). His *Histoire de France racontée a mes petits Enfants* was completed and published by his daughter, Madame Guizot de Witt (5 vols. 1870–75).

During the second empire Guizot lived tranquilly in retirement, chiefly at his residence of Val Richer, near Lisieux, in Normandy. On January 19, 1870, he made his first political appearance in public since 1848 by attending a reception given by the third Napoleon's 'Liberal' minister, M. Ollivier. He followed with a painful interest the fortunes of his country in the war with Germany. He approved of the conduct of the Government of National Defence in deciding to carry on war *à outrance*. In a letter to the *Times* on the subject, he mentioned the fact of his having four sons on the ramparts. The veteran statesman survived for more than three years the greatest humiliation his country had ever suffered, dying September 12, 1874.

That Guizot was a man of high personal character, that he led a simple life, and that he despised wealth are beyond doubt. He was a patriot also, according to his lights; if at one period he intrigued abroad and at another connived at corruption at home, he did it for the aggrandisement of his country, not for his own advantage. It must be admitted, however, that constitutional pedantry, obstinacy, and self-sufficiency prevented him from being a great, in the sense of an accommodating and far-seeing politician. As a historian he was painstaking and, on the whole, accurate, but he was not brilliant. Altogether Guizot, though not a great man, was a large and important figure in the history of France and of his time.

The leading authorities on the life of Guizot are his own Memoirs, and *Guizot in Private Life* by his daughter, Madame de Witt (Eng. trans. 1880); Jules Simon, *Thiers, Guizot, Rémusat* (1885); Thureau-Dangin, *La Monarchie de Juillet* (1889); and small biographies by Crozal (1893) and Bardoux (1894). See also Evelyn Ashley's *Life of Viscount Palmerston* (1876), Torrens's *Memoirs of Lord Melbourne* (1878), and Spencer Walpole's *Life of Lord John Russell* (1889).

Gujarat, or GUZERAT, the northern maritime province of Bombay, has, in the narrower sense, an area of 10,296 sq. m., and a pop. (1891) of 3,098,197. In its widest sense on the other hand (with Kathiawar) it has an area of over 70,000 sq. m., and a pop. of 10,000,000. Within the wider limits lie the British districts of Surat, Broach, Kaira, Panch Mahals, and Ahmadabad, the territories of the Gaekwar of Baroda (q.v.), and numerous petty native states. Of these last 180 are on the peninsula of Kathiawar, which projects into the Arabian Sea to the north of the Gulf of Cambay. Gujarati is one of the seven main Aryan vernacular languages of India (q.v.). See also GUJRAT.

Gujranwala, chief town of Gujranwala district, in the Punjab, 40 miles N. of Lahore, on the Northern Punjab State Railway, lies in a flat plain, is notorious for its bad sanitary condition, and has some local trade and petty manufactures. It was for a time the capital of the Sikh power, and Ranjit Singh was born here. Pop. 23,000.—The *district* has an area of 3017 sq. m., and a pop. of 690,169, three-fourths Mohammedans.

Gujrat, or GUZERAT, the chief town of Gujrat district, in the Punjab, has been left (by a change in the river's course) a few miles north of the present bed of the Chenab, but is a place of some military and political importance, as well as the centre of a considerable trade. It produces cloth and cotton goods, brass vessels and gold inlaid-work, and boots and shoes. Here, in 1849, a decisive battle was fought, which finally broke the Sikh power, and brought the whole Punjab under British rule. Pop. 19,000.—The *district* has an area of 2051 sq. m.; pop. 760,875. See also GUJARAT.

Gulden. See FLORIN.

Gules (*gueules*, the French heraldic term for 'red,' is the plural of *gueule*, 'the mouth,' Lat. *gula*), the term by which the colour red is known in heraldry. See HERALDRY.

Gulf Stream and Oceanic Currents. The Gulf Stream is the best known, the best defined, and the most remarkable of all the ocean currents (see map at ATLANTIC). It derives its name from the Gulf of Mexico, out of which, as a great current of warm water, it flows through the Strait of Florida, along the eastern coast of the United States of America, and is then deflected near the banks of Newfoundland diagonally across

the Atlantic. This great body of warm water indirectly modifies the climate of western Europe, and it is possible to trace its effects as far as the coasts of Spitzbergen and Nova Zembla. It is essential in describing the Gulf Stream to take into consideration the general question of oceanic circulation, and the thermal conditions of the ocean made known from the explorations of the *Challenger*, *Blake*, and other recent expeditions.

The prevailing winds of the globe are determined by the distribution of atmospheric pressure, and the position of barometric maxima and minima are in turn determined by the distribution of land-masses and water-surfaces. The wind blows out of and around high-pressure or anticyclonic areas, and into and around low pressure or cyclonic areas (see ATLANTIC). By comparing the maps of the prevailing winds with those of the oceanic currents, it will be seen that the latter roughly coincide with the winds blowing out of and around the high-pressure areas in the Atlantic and Pacific oceans. There have been many theories to account for oceanic circulation, but recent researches show that all the principal surface currents have their origin in, and are maintained by, the action of the prevailing winds of the globe, modified locally by variations in temperature, density, evaporation, gravity, and rotation of the earth.

The phenomenon of oceanic circulation is to be seen in its simplest form in the westerly wind-driven currents of the trade-wind regions of the Atlantic and Pacific. The heated surface waters of the tropics are there driven to the west, and banked up towards the eastern shores of America, Africa, Asia, and Australia. On the other hand, the cold deep water is drawn up along the western shores of America and Africa to take the place of the surface water driven before the trade-winds. The temperatures of the water towards the western parts of the oceans are thus higher and more uniform to considerable depths below the surface than in the eastern, where they are lower and have a wider range at different seasons or different states of the wind. The writer has even measured this effect of the wind in Loch Ness in Scotland; he found the cold water from the bottom drawn to the surface in the course of a few hours, and the warm surface water banked up to the north end of the loch, during a southerly gale. Recent observations show that similar effects are produced in the great oceans during a continuance of winds off shore.

In the Atlantic a large proportion of the waters of the equatorial current are forced into the Caribbean Sea through the passages in the Windward Islands, and then into the Gulf of Mexico, principally through the Yucatan Channel. The amount of accumulation or heaping up of water in the Gulf of Mexico, through the action of the trade-winds, has been measured by the officers of the United States Coast Survey; it has been found that the Atlantic Ocean at Sandy Hook is 3 feet 4 inches lower than the waters of the Gulf of Mexico at the mouth of the Mississippi. This is partly the origin of the force constantly at work to keep up the flow of the Gulf Stream through the Strait of Florida. The stream as it flows through the narrowest part of the strait is 50 miles wide, and has an average depth of 350 fathoms. In the axis of the stream the velocity is four or five knots an hour, two miles an hour or even less along the edges, and probably the same near the bottom. It is estimated to be 150 miles wide off Charleston, and 300 miles wide off Sandy Hook; it then spreads fan-like over the surface of the North Atlantic. Off Cape Hatteras the velocity is about three miles an hour, off the banks of Newfoundland one and a half mile an hour, then the rate slowly merges into that of the north-easterly drift of the Atlantic—four or five miles a day. The mean surface temperature in the straits is 81°·5 F.; off Sandy Hook, 73°·4 F. The average bottom temperature in the strait at 400 fathoms is but 45° F.; off Charleston, at 300 fathoms, 53° F.; and off Sandy Hook, in 200 fathoms, 46°·5 F. The bottom in the strait, and for some distance north on the 'Blake plateau,' appears to be swept by the current so that no fine ooze is allowed to form; but the bottom, where hard, is made up of the remains of surface and bottom-living organisms, often cemented together into nodules and phosphatic concretions. The diagram in the article ATLANTIC shows the distribution of temperature across the Gulf Stream between New York and Bermuda. The Gulf Stream water of the North Atlantic is carried towards the coasts of Europe by the south-west winds; one branch passes on to the coasts of Norway, and another south to the coasts of Spain and Africa. As this water is carried into colder latitudes it sinks on becoming cooled because of its greater density, so that off the coasts of Britain warmer water is found at a depth of three-fourths of a mile than at a like depth off the tropical coast of Africa, where the winds are off shore. While a warm current passes to the Arctic Ocean along the coasts of Norway and Lapland, a cold current from the Arctic comes down the coasts of Greenland, and along the coasts of Labrador and the United States, inside the Gulf Stream, and ultimately sinks beneath it into the deeper parts of the North Atlantic basin. The passage from the green, cold, turbid waters along the American coast into the deep blue, warm waters of the Gulf Stream is sometimes sudden and well marked, and is usually observed by all who sail from the shore seaward.

The winds blow out of and around an area situated in the North Atlantic, between the north of Africa and America, and the surface currents of water also circulate around this area, which is known as the Sargasso Sea. Here are found immense banks of floating Gulfweed (q.v.), covered with peculiar species of animals: Crustaceans, Polyzoa, Annelids, Molluscs, Hydroids, and Fishes, all the same colour as the weed, presenting remarkable examples of protective resemblance.

A very similar, but not such a well-defined or constant stream as the Atlantic one, is found in the North Pacific, and is known as the Kuro Siwo ('Black Stream') or Japan Stream. On approaching Japan in April from the south the *Challenger* found a belt of water running to the eastward at the rate of three miles per hour. In this stream the temperature changed from 63° to 68° F. suddenly several times without any alteration in the rate of the current. In June no current was found 30 to 40 miles from the coast, but close to the south coast of the main island there was a northward current of two miles per hour and a mean temperature of 72°·5 F. Alternating bands of cold and warm water were also found by the *Challenger* in the Gulf Stream near its shore edge. The origin of these alternate belts of water in the Japan Stream is probably due to the monsoons. The northern equatorial current striking against the eastern side of the Philippine Islands is, as is well known, diverted to the northward, along the eastern side of Formosa, after passing which it appears gradually to lose its distinctive character. During the north-east monsoon a cold surface current is running to the southward from the Japan and Yellow seas. It appears therefore highly probable that the equatorial current, instead of losing itself as is supposed, when it meets with the cold water from the Japan and Yellow seas, is diverted to the eastward along with a cold northerly current, the two running together side by side without intermingling their waters. When the north-east monsoon ceases the current

from the Japan and Yellow seas also ceases, which causes the slackness of the Kuro Siwo, south of the main island, in June, as it is then only due to the equatorial current. Later on, in July and August, when it is further augmented by the surface drift from the China Sea in the south-west monsoon, it runs again with great rapidity, and is wholly a warm current. These peculiar effects are probably not experienced to the eastward of the meridian of 140° E.; there apparently the stream is always a warm one. The current that runs from the Arctic Ocean through Behring Strait is insignificant compared with the Arctic currents of the Atlantic. There is an ill-defined Sargasso Sea in the North Pacific, in some respects resembling that of the North Atlantic. The surface currents in the Indian Ocean are, as is well known, changed with the shifting of the monsoons.

From the *Challenger* observations it appears to be proved that the dense warm equatorial waters which pass along the eastern shores of South America, Africa, and Australia into the Great Southern Ocean that surrounds the world in latitudes beyond 40° S., become cooled in these latitudes, and sink to the bottom through the other waters on account of their greater density. This water is then drawn slowly north as a great indraught to supply the loss by surface currents and evaporation in the equatorial regions of the Atlantic, Pacific, and Indian oceans. It appears then that by far the larger part of the cold water that fills these great ocean-basins is cooled and sinks to the bottom in about 50° S. lat. A portion of this water seems also to be drawn southward to supply the place of the relatively light though cold surface currents that flow north from the Antarctic in the regions of floating ice. The great bulk of the ocean has a low temperature—below 45° F.; it is ice cold in the Atlantic at the bottom even under the equator. The warm surface water is a relatively thin film, but this film is much deeper towards the western parts of the oceans in the tropics than in the eastern. On the other hand, in the regions of the westerly winds of temperate latitudes the layer of warm water is deeper in the eastern parts of the oceans, as has been already noticed in referring to the deep-water temperatures off Britain and tropical Africa. These facts are clearly shown on the *Challenger* maps, showing the distribution of temperature at 10, 20, 50, 60, 100, and 300 fathoms.

The surface currents may, as we have seen, have a considerable velocity, but there is no evidence that any such currents exist in the deeper waters at the bottom of the ocean; the movements there must be slow and massive. It is true that between oceanic islands and in positions like the Wyville-Thomson Ridge, between Scotland and the Faroe Islands, where the tidal wave is confined, the ridges are swept by currents at a great depth; but these are exceptional cases. In the open ocean the temperature decreases with increase of depth, except in the Arctic or Antarctic, where there is melting ice on the surface. In enclosed seas, like the Mediterranean, Caribbean Sea, Gulf of Mexico, Sulu Sea, and many others, there is a large body of water at the bottom of a nearly uniform temperature; the depth at which this uniform temperature is reached depends on the height of the ridges cutting enclosed seas off from general ocean circulation. The deeper water in these can only be renewed by vertical currents set in motion by the winds or by convection currents. The direct influence of ocean currents on climate is undoubtedly great, but this influence is most marked by the indirect effects of the prevailing winds blowing from off these currents towards the land, carrying with them heat and moisture.

Gulfweed (*Sargassum*), a genus of seaweeds (Algæ) of the sub-order Fucaceæ, of which two species (*S. vulgare* and *S. bacciferum*) are found floating in immense quantities in some parts of the Atlantic, Pacific, and Indian oceans. They are tropical plants, although sometimes carried by winds and currents to the British coasts. The frond is very long, and is furnished with distinct, stalked, nerved leaves, and simple axillary stalked air-vessels. The receptacles are linear, in small axillary clusters or racemes. The trivial name *bacciferum*, applied to one of the species, is derived from the berry-like appearance of the air-vessels. The gulfweed has only been found floating, but there is reason to think that it is at first attached to the bottom of comparatively shallow parts of the sea. It floats in large fields, or more frequently in long yellow lines in the direction of the wind. In crossing the Atlantic, its presence is regarded as a sure indication of the Gulf Stream, by which it is wafted northward and eastward. Where the Gulf Stream is deflected from the banks of Newfoundland eastward, and sends off its more southern branch towards the Azores, is situated the *Sargasso Sea*, 'that great bank of weeds, which so vividly occupied the imagination of Christopher Columbus, and which Oviedo calls the seaweed meadows' (Humboldt). The quantity of floating seaweed is often such as to impede the progress of ships. Multitudes of small marine animals accompany it, with fishes ready to prey on them.—The gulfweed is eaten in China; and in other parts of the East also it is used in salads and as a pickle.

Gull (*Larus*), a genus of web-footed birds belonging to the Laridæ, a family of long-winged sea-birds having the longitudinal nostrils placed laterally and not covered by a cere, the three anterior toes completely webbed, the hind-toe, when present, small and not touching the ground. The family includes the Scissor-bills or Skimmers (Rhynchopidæ), the Terns or Sea-swallows (Sterninæ), and the true Gulls (Larinæ). The true gulls are of less slender build than their nearest allies, the Terns; their wings are not quite so long and pointed, and they have the bill more hooked. The most important genera are Stercorarius, the voracious and predatory Skuas; Rissa, the Kittiwakes; Xema, the fork-tailed Gulls; and Larus.

The genus Larus comprises sixty species, cosmopolitan in their distribution, and includes many of the larger gulls and most of those common in Great Britain. The prevailing colour is 'white, with a gray mantle varying in shade from the most delicate pearl gray to a dark blackish slate or nearly black,' and there are often black markings about the head, which, however, vary in different seasons. The two sexes are usually almost alike in colour, but the young are dusky and brownish and have the bill dark, while in adults the bill, legs, and feet are bright red or orange. The legs are very powerful, and are placed well forward so that the body is carried horizontally, the bill is stout and curved, with a prominent angle on the lower part and a corresponding swelling on the upper. Though most gulls are marine, they frequent, and even breed by inland lakes not far from the sea, and large flocks of them may often be seen following the plough eagerly picking up the worms and grubs. They are very voracious and will eat almost anything, but feed chiefly on fish and molluscs. To break the shells of the molluscs they sometimes carry them high into the air and drop them upon a rock. Audubon tells of a gull observed by him which, when the shell did not break the first time, carried it a second time higher, and a third time higher still. Some of the larger species—e.g. the Great Black-backed Gull (*L. marinus*), prey even upon the eider-duck and other wild fowl, and very many

steal the eggs of other birds. Many of the species are migratory, and all are powerful of wing and fly with apparent ease against a storm, during which, however, they never soar so high as in fine weather. Their keenness of vision is remarkable, as must have been observed by every one who has watched them following in the wake of a steamer, and noted the distance from which they see even a small fragment thrown on the water, and the unerring precision with which they dart down upon it.

Heads of Various Species of Gulls:
1, Great Black-backed (young); 2, Black-headed; 3, Kittiwake; 4, Lesser Black-backed; 5, Herring Gull.

Gulls often nest together in large numbers, and to dwellers by the sea a 'gullery,' with its busy life and incessant noise of screaming and quarrelling, is a not unfamiliar sight. The characteristic cry of many gulls is well suggested in the old name of 'Sea-mews.'

The most widely distributed British species is the Herring Gull (*L. argentatus*), which breeds on precipitous cliffs or isolated rocks all round the coast. The nest is made of grass and is usually placed on a ledge of rock, but sometimes on the ground; and Howard Saunders says that in North America, when the bird has been repeatedly plundered by fishermen, it even nests in trees. The eggs, usually three in number, are light brown, green, or pale blue, mottled with a darker shade. The male bird measures 22 to 24 inches, the female is slightly smaller; the gray of the back and wings is lighter than in most species, and on this account it is often called the Silvery Gull. The Common Gull (*L. canus*) is only a winter visitor to England and Wales, but breeds abundantly on the Scottish coasts and fresh-water lochs, in the Hebrides, and in Orkney and Shetland. It lays three eggs, breeding in colonies on grassy islands and slopes not far above the level of the sea, and seldom going far from land. Its average length is 18 inches. The Great Black-backed Gull (*L. marinus*) rarely breeds in England, though large flocks may be seen at some seasons. In Scotland, particularly in the Outer Hebrides, it is more plentiful, though by no means common. The Lesser Black-backed Gull (*L. fuscus*) is very abundant in the marshes of Cumberland, and nests also in Devon, Cornwall, and throughout Scotland. Its plumage is white in summer except on the mantle, where it is dark gray or black. The Black-headed Gull (*L. ridibundus*) is the commonest species in Ireland, and is plentiful on the flatter portions of the English and Scottish shores. It has a dark-brown hood in summer which disappears in winter. The Glaucous Gull, or Burgomaster (*L. glaucus*), and the Iceland Gull (*L. leucopterus*), visit Britain occasionally in cold weather. One specimen of Ross's Gull (*Rhodostethia rosea*) was shot in Yorkshire in 1846. Nothing is known of the breeding habits of this rare and beautiful Arctic species, and only twenty-three examples had been recorded previous to 1881–82, when it was seen in large flocks off Point Barrow in Alaska. About thirty specimens of another truly Arctic species, the Ivory Gull (*Pagophila eburnea*), have been taken in Britain at various times. In North America gulls are very plentiful. The Great Black-backed Gull (*L. marinus*) and Herring Gull (*L. argentatus*) are common in the north-east, while the Common Gull is represented by two closely related species (*L. brachyrhyncus* and *L. delawarensis*). The Mackerel Gull (*Hydrocolœus scopulinus*) of New Zealand may often be seen in attendance on the long-billed oyster-catcher as he digs in the soft sand for blue crabs and other delicacies, waiting quietly until something is discovered, then flapping his wings and making a dash at it. Even if the oyster-catcher succeed in flying off with his prize he is inevitably overtaken and compelled to give it up to the swifter and stronger gull.

The Great Skua (*Stercorarius catarrhactes*), which breeds in the Shetlands, and is occasionally seen on the coasts or fishing-grounds farther south, is a splendid example of a robber gull, deriving its food chiefly by victimising or even killing other sea-fowl. It measures about 2 feet in length; the plumage is predominantly brown, 'with white bases to the quills conspicuous in flight;' the cry, as the name suggests, is *skui, skui;* the nest is a cavity in the moss and heather of the highest moorlands, and is prepared in the later half of May; the eggs (never more than two) are olive-brown. Three other species of Skua are recorded among British birds.

The Kittiwake (*Rissa tridactyla*) is a very common bird on British coasts, and is elsewhere widely distributed. As the specific name suggests, the hind-toe has disappeared; the length of the body is about 15 inches; white predominates in the plumage, but the upper surface is gray, and there is some black on the wing. The kittiwakes feed on fish and other marine animals, make nests of seaweed and flotsam on the rocky ledges, lay two or three eggs 'from grayish-white to olive-buff, blotched and zoned with ash-gray and rich brown.' Howard Saunders notes that as the eggs are seldom laid until the later part of May, many of the young can scarcely fly or are still in the nest by 1st August, when the Sea Birds Protection Act leaves them to be slaughtered in thousands to provide plumes for ladies' hats.

The flesh of gulls is rank and coarse, but that of the young birds is salted for winter use on many northern coasts. The eggs are much sought after, and it is stated that from 40,000 to 50,000 eggs of the herring gull are taken for food, in a single season, from the island of Sylt alone. See Howard Saunders, 'The Larinæ or Gulls,' in *Proc. Zool. Soc.* (1878); and his and other manuals of British birds.

Gull, Sir William Withey, physician, was born 31st December 1816, at Thorpe-le-Soken, in Essex. He studied at Guy's Hospital, and graduated M.B. at London University in 1841. Six years later he was made professor of Physiology at the Royal Institution, a post which he held for only two years. About the same time (1847) he became physician and lecturer at Guy's Hospital, his specialty being clinical practice. For his treatment of the Prince of Wales in 1871 he received a baronetcy, and was appointed physician-extra-

ordinary to the Queen. He became a Fellow of the Royal College of Physicians (1848) and of several other medical and learned societies. He died 29th January 1890. Sir W. W. Gull published numerous papers and addresses, as *Reports on Epidemic Cholera* (with Dr W. Baly) in 1854; *Gulstonian Lectures on Paralysis*; the Hunterian oration in 1861 and the Harveian in 1870; and *Alcohol as a Medicine and as a Beverage* (1878). His collected works were edited for the New Sydenham Society by Dr Acland in 1893 and following years.

Gullet. See DIGESTION, Vol. IV., p. 814.

Gulliver's Travels. See SWIFT.

Gum, a general term applied to certain exudations from trees and plants, which are very different in their chemical characters and their general properties. There are, however, three classes of gums which may be more particularly referred to — viz. those containing arabin, those containing bassorin, and gum resins.

(1) *Gums containing arabin* are best represented by gum-arabic, the ordinary gum of the shops. This substance is found as an exudation on the bark of the *Acacia Senegal*, a tree of some 20 feet in height, growing abundantly in western Africa. According to the care taken in collecting it, it ranges from the pure white or colourless gum of Kordofan to the dark-reddish varieties imported from Senegal. Chemically these are absolutely identical, and therefore a single description will suffice. It occurs in irregular lumps, somewhat spherical or vermicular (as in Gum-Senegal). It is brittle, and shows a glassy fracture. It dissolves readily in water, forming a clear, viscid, adhesive solution; but it is insoluble in strong alcohol, glycerine, ether, oils, or chloroform. The addition of alcohol to a watery solution throws down a precipitate of arabin, if a few drops of hydrochloric acid have previously been added.

Medicinally it has very slight remedial powers, but it is largely used in prescriptions for the purpose of suspending insoluble substances in mixtures. The finer varieties, owing to their cost, are rarely found outside the druggist's shop; but in the manufacture of confections and in the arts large quantities of the cheaper kinds are employed. These are known under different names, indicating the district from which they are imported. The chief are: Senegal gum, found in large firm reddish masses; Suakin gum or Talka gum, forming dull opaque-looking tears, colourless or brownish; and Morocco or Barbary gum. Cape gum is derived from the *Acacia horrida*, a native of Cape Colony, while Wattle gum is a very adhesive variety obtained from Australia. East Indian gum is an African product, being simply imported into Bombay from the Red Sea.

(2) *Gums containing Bassorin.* The chief of these, Tragacanth, is obtained from various species of Astragalus, low spiny bushes, natives of Asia Minor and Persia. When the stem of one of these plants is cut transversely it will be found that the space usually occupied by the pith has the appearance of a translucent gummy mass, which the microscope shows to possess the structure of an ordinary pith. If incisions are made in the bark, this semi-solid exudes under pressure, and, according to the nature of the incision forms flattened wing-like masses, nodules or worm-like pieces. The finest variety is known as Flake-Tragacanth, consisting of flakes 1 to 3 inches long by 1 inch in breadth. The surface is marked by wavy lines and the flakes are much contorted. Tragacanth is translucent, white and without lustre, somewhat flexible, and not brittle, and with little taste or smell. When placed in water it swells, absorbing fifty times its weight of that liquid, and form ing a thick mucilage. It has no active medicinal properties; but it is much used for firming pill masses and lozenges. It enters into many emulsions, for instance, that of cod-liver oil, and it is sometimes employed as a stiffener for the hair. It is used as a stiffening material for various textile fabrics, and is much valued for this purpose, where it is not desired to give gloss to the material.

Besides these true gums, there are (3) *the gum-resins.* In general terms these consist of certain resins soluble in alcohol, and of the true gum, so that it requires both water and alcohol to dissolve them entirely. They are chiefly used in medicine and perfumery, and may be said to form a connecting link between the true gums and the true resins, commercially speaking. The principal are: (1) Gum-Ammoniacum (see AMMONIACUM), (2) Gum-Asafœtida (see ASAFŒTIDA), (3) Gum-Benzoin (see BENZOIN), (4) Gum Galbanum (see GALBANUM), (5) Gum-Gamboge (see GAMBOGE), (6) Gum-Myrrh (see MYRRH), (7) Gum-Scammony (see SCAMMONY). There are many other gums known; but these are the ones most used in the arts and medicine. Many also of the true resins, as copal, anime, &c., are called gums, but they are strictly resins. See RESINS.

Gum-substitutes are manufactured from various forms of starch, either by baking, roasting or chemical treatment, so as to convert the starch into Dextrine (q.v). They are made on a very extensive scale, and are largely employed in dressing calicoes and other fabrics, also as a substitute for the more expensive gums in gumming-paper, as in the case of postage-stamps and labels, which are made adhesive by dextrine. For this and some other purposes, the *gum-substitutes* are superior to the real gums, as they are easily dissolved, and can be spread more equally over a smooth surface. For the chewing-gum in use in the United States, see CHEWING-GUM; and for gum-trees, see EUCALYPTUS, TUPELO, and LIQUIDAMBAR.

Gumbinnen, a thriving town of East Prussia, 72 miles by rail E. of Königsberg. Dating from 1724, it owes its prosperity to the settlement eight years later here of many Protestant Salzburgers. There are machine-works, &c. Pop. 10,206.

Gum-boil, an Abscess (q.v.) near the root of a tooth, and usually discharging itself towards the mucous membrane of the gum, but sometimes making its way more deeply towards the skin of the face, and if allowed to burst there causing considerable deformity. Gum-boil should be treated, in the first instance, by protection against cold and external injury, and free washing of the mouth with hot water; but as soon as the presence of matter can be ascertained, it is usually a good practice to give vent to it by a pretty free incision. Complete cure follows the removal of the tooth at the root of which the inflammation has begun; if it be left the disease is apt to recur. If the abscess threaten to burst through the skin, extraction of the tooth is imperative. See TEETH.

Gumming (in vegetable pathology *Gummosis*), a disease which attacks the plum, cherry, peach, and other stone fruit-trees, often proving fatal to the limbs attacked, and ultimately also to the whole tree in virulent cases. Recent observations seem to prove that the cause of the disease is a fungus named *Coryneum Beijerinckii*. The mycelium of the fungus develops a ferment which transforms the cell-walls, starch granules, and other contents of the cells into gum. While in some cases the mycelium is obviously the exciting cause, in others the ferment only appears to be the contagious agent. One point seems quite clear—the fungus cannot penetrate sound healthy bark—there must be some wound or abrasion before the

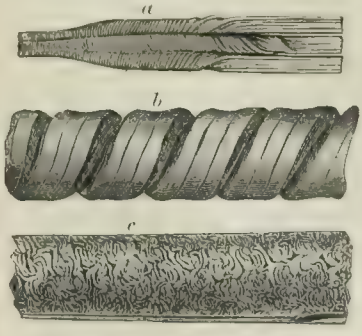
germ-tubes can enter the cellular tissues in which alone they can spread. Unfortunately such injuries occur from many causes in the class of trees named, and probably insects are the chief agents in carrying the contagion from tree to tree. In prescribing remedies, those that are preventive are obviously best. Wounds as soon as they are observed should be coated with a thick paste of quicklime or coal-tar. Gummed branches should be cut away without delay and burned, and the wounds dressed at once with coal-tar.—It is conjectured that Coryneum or some similar fungus is the cause of the disease that produces gum-tragacanth, and probably other gums and gum-resins.

Gumri. See ALEXANDROPOL.

Gumti, a river of India, rises in the North-western Provinces, in a small lake in 28° 37′ N. lat. and 80° 7′ E. long., and, after a sinuous but generally south-easterly course of nearly 500 miles, enters the Ganges 56 miles below Jaunpur. It is navigable by boats of 17 tons for over 400 miles; at Lucknow it is spanned by five bridges, and at Jaunpur by a bridge of sixteen arches.—There is also a Gumti River in Bengal, which joins the Meghna after a course, inclusive of windings, of 66 miles.

Gun. The term gun formerly comprised many varieties of the weapons now more correctly termed Firearms (q.v.), and is still applied in a general sense to Cannon (q.v.) and large ordnance, also to quick-firing or Machine Guns (q.v.); but it is now more specially held to signify the sporting gun as distinguished from the military Rifle (q.v.). The modern shot-gun is invariably breech-loading, and usually upon the 'drop-down' principle (see BREECH-LOADING). The manufacture of shot-guns is an important British industry, and one of the processes of manufacture—barrel-welding—is sufficiently interesting to warrant descriptive details. The other processes, some eighteen or twenty in number, call only for the skill of the trained workman.

Shot-gun barrels are generally hand-forged from a rod of special material which is usually composed of iron of two distinct varieties, or of iron and steel. It is necessary that one of the metals be softer than the other; and the greater the proportion of the harder metal, and the harder the quality of the softer metal, the better will be the quality of the welded barrel. Some varieties of gun-iron contain 70 per cent. of steel; in others a good quality and an inferior quality of iron are used together, and no steel enters into the composition. The rod of gun-iron is built up of alternate layers of the hard and soft metals, and in the manufacture of a Damascus barrel this rod must be twisted upon itself before it is welded side by side to one or more rods, or welded into a barrel. These twisted rods are drawn out between rolls into a flattened rod or 'riband' of metal, the riband being composed of one, two, three, or more twisted rods according to the quality of the barrel or the *fineness* of figure desired. The Belgian welders are more expert than the British in making the finest figured barrels, putting as many as six differently twisted rods together to form a single riband; but Belgian barrels are not so hard as the English, and are generally considered to be inferior to the best Birmingham hand-welded barrels. The welder, having prepared his iron and received it from the mill rolled down to the proper size, proceeds to form the barrel by twisting the riband upon a mandril, just as one would cover a whip-stock with a narrow strip of leather. This coil has then to be heated, a few inches at a time, and the edges welded to each other, the result being a tube four times heavier than it will weigh when finished by boring, grinding, and filing, which are the next three processes through which the barrel must pass. In double shot-guns the two tubes to form the barrels are brazed together for a few inches at the breech end, and soldered to each other and to the two ribs and 'packing' which unite them throughout their entire length. The breech actions are fitted to the barrels, the lock-work and bolting-mechanism adjusted, and the gun is ready for the stocker; he roughly fashions the piece of walnut to which the ironwork is secured by the 'screwer,' who passes the gun on to the 'finisher' to prepare for its final embellishments, in which are comprised the processes of polishing, engraving, hardening, blueing, and tempering. The barrels when finely polished are treated with acid, which rusts the surface of the metals of which they are composed, and eating more readily into the softer metal turns it a darker colour. This process, termed 'browning,' occupies several days, and when successful shows clearly the damascening or curls of fibre obtained by twisting the gun-iron rods in the earliest stage. A barrel not showing such curls would be termed a 'scelp' barrel if it were a twisted welded barrel, but if of one uniform colour, unbroken by regular markings, it would probably be composed of plain iron or steel only.



a, gun-barrel iron, twisted and laid into a riband; *b*, portion of gun-barrel coil; *c*, portion of silver-steel Damascus barrel.

The superiority of the Damascus barrel to one of best modern steel remains a vexed question. The evidence adduced on behalf of the Damascus is sufficient to prove its superiority over certain qualities of steel, but it is not overwhelming; and it is now generally admitted that steel can be obtained of sufficiently good quality and possessing sufficient strength to withstand any normal strain to which as a shot-gun barrel it may be subjected. The advocates of the welded barrel contend that flaws, which cannot be detected by the eye or by the most searching test, occasionally exist in steel, making it unreliable for use as a gun-barrel. Sir Joseph Whitworth's fluid compressed steel has been used very successfully as a material for shot-gun barrels, but the immunity from flaws which barrels of this steel enjoy is said to result from the careful testing and examination of each individual tube rather than from absolute perfection in the metal itself. The complete and almost perfect heterogeneity of the material of the Damascus barrel produces a homogeneous whole, which, when soundly welded, has no weak spot, and will neither split longitudinally nor break off short as steel barrels have done, but when burst is pulled, as it were, from shred to shred, exhibiting great tenacity in every direction. The steel barrel here referred to is that drilled from a solid rod of best mild steel. Steel barrels drawn from blanks in the same manner as ordinary tubes are inferior to the drilled barrel. Still less reliable are the lap-welded steel barrels in which the two edges of a strip of metal are brought together and welded as it passes at welding heat between the rolls. Cold drawn steel barrels were at one time manufactured, but proved too expensive, and twisted steel barrels are not yet a

commercial success. The standard size of the modern shot gun is 12 bore—i.e. twelve spherical leaden bullets of the same diameter as the interior of the barrel will weigh 1 lb. avoir.; formerly 16 and 20 bores were much in vogue, and 16 bores are still very common in Germany; 10 bores are much used in North America; 8 and 4 bores are used only for wild fowling; and *punt-guns*, guns of from 1-inch to 3-inch bore fitted into shooting punts, are employed for firing from ½ lb. to 4 lb. of shot at a time into flocks of sea-fowl on the coast or in tidal estuaries.

With the exception of the punt-guns, which require special mechanism, guns of all bores are made upon the same principle of breech-loading, and nearly all are more or less choked—i.e. the diameter of the barrel is suddenly lessened near the muzzle, forming a cone which causes the pellets of the charge to fly from the gun more compactly and at an increased velocity. Such is the perfection to which the boring of shot-guns has been brought that a 7-lb. gun may now be expected to send on an average 220 pellets of a charge containing 305 pellets into a circle 30 inches in diameter (or 60 into a 10-inch square) at 40 yards distance, the pellets having an average velocity at the muzzle of 840 feet per second, and a striking force at impact (40 yards) of 1·90 oz.

Shot-guns are now built very much lighter than when breech-loaders first came into general use (1865); shorter barrels are used without loss of shooting power or appreciable increase in the volume of the recoil. Smokeless explosives are in general use all the world over for shot-guns, and the results of the slightest variation in the charge or quality of the powder, or in the size and quantity of the shot, can be ascertained with the greatest scientific accuracy, by means of special instruments found in all leading gun-manufactories. Shot-gun manufacture is a mechanical science as well as a handicraft, and the finest productions of the most renowned gun-makers will always command £50 or even higher prices. Cheap ill-made, ill-fitted, ill regulated guns, shaped by machinery, or still more roughly by hand labour, constitute the shot-gun of commerce, and their value fluctuates with the price of material. The shot-gun of the best class is now so highly perfected that a new departure, whether towards the development of the killing powers of the weapon or elaboration of its mechanism, is undesirable, and, until some radical change in the composition of explosives, or the method of using shot-guns, takes place, no noteworthy improvement upon the existing type of gun can be expected.

See the articles GUNPOWDER, FIREARMS, BREECH-LOADING, CANNON, MUSKET, RIFLE, MACHINE GUNS, &c.; Greener's *Gun and its Development* (1881; 7th ed. 1899); his *Modern Shot Guns* (1888); Hawker's *Guns and Shooting Instructions* (1844); *Shooting*, by Lord Walsingham and Sir R. Payne-Gallwey (Badminton Lib. 1886); Payne-Gallwey's *The Fowler in Ireland* (1882; Walsh's *Modern Sportsman's Gun and Rifle* (2 vols. 1883–84); General Norton's *American Inventions and Improvements in Breech-loading, Small Arms, Heavy Ordnance, Machine Guns, Magazine Arms, &c.* (New York, 1889).

Gunboat, a small boat or vessel armed with one or more guns of heavy calibre. From its small dimensions, it is capable of running close inshore or up rivers, and from the same cause it has little chance of being hit by a larger vessel at the long range which the carrying power of its guns enables it to maintain. At the outbreak of the Russian war, a large squadron of them was hastily constructed for the British navy for the first time. Their tonnage was small; and their armament usually consisted of one 8-inch gun and one 100-pounder Armstrong gun. Gunboats in their more modern form (like the *Staunch*) are small mastless vessels mounting one large gun in the bow, and propelled by an engine with single or twin screws. The gun is pointed by means of the helm or the screws, and the gunboat is in fact a floating gun-carriage. In the British navy these gunboats carry an armour-piercing gun of 18 tons, on a draught of only 4 feet. But they have been designed to carry 35-ton guns, or heavier. In 1890 there were on the British *Navy List* 114 of these vessels, of which 43 were called third class, and are intended for coast defence. In 1900 there were in the navy 33 torpedo gunboats, the largest form of special torpedo boats. At the beginning of the century the United States had over 250 of these vessels; but the 'gunboat system' was soon abandoned. In 1899 the United States navy possessed 17 gunboats of from 900 to 1400 tons, armed with 4-inch quick-firing guns and light secondary batteries. They are mainly unarmoured, though some have a slight protective deck. Most Continental navies are provided with gunboats of various size and construction.

Gun-carriage is a most important adjunct to every piece of ordnance. It requires to be of great strength in order to resist the shock of discharge, and, in the case of a field-gun carriage, to bear an enormous strain in passing at a rapid pace over broken, uneven, or rocky ground without being unduly heavy or wanting in mobility. A large department, fitted with splendid machinery, in the Royal Arsenal at Woolwich, called the Royal Carriage Department, is charged with this branch of manufacture for the British service, whether naval or military. See CANNON for plates showing several of the numerous patterns, and also MONCRIEFF PITS.

Gun-cotton. There are a very large number of explosive nitro-compounds which may be divided into two main classes—viz. (1) Those containing Nitro-glycerine (q.v.), in which is included the great dynamite class, and (2) those not containing nitro-glycerine. Gun-cotton is an explosive nitro-compound of the latter class, and is by far the most important of the class.

So long ago as 1832 it was discovered by Braconnot that woody fibre and similar substances could be converted into highly combustible bodies by the action of concentrated nitric acid; six years later Pélouze extended this discovery to cotton and other organic substances; he was followed by Dumas, who treated paper in a similar way, and he proposed to make cartridges with paper so treated, the idea being that no residue would be left in the barrel after firing such cartridges. But no practical result followed these discoveries until in 1845 Schönbein, a German chemist, having hit upon the proper mode of treating cotton with nitric and sulphuric acids, announced the discovery of gun-cotton, which he proposed as a substitute for gunpowder. He claimed for it that the advantage it had over gunpowder was that it burned without leaving any residue, and consequently without smoke. He prepared it by immersing carded cotton wool in a mixture of nitric and sulphuric acids, and the equation for its formation may be stated thus:

Cellulose.	Nitric Acid.	Bi-nitrated Cellulose or Gun-cotton	Water.

$$C_6H_{10}O_5 + 3(H.NO_3) = C_6H_7O_2.3(NO_3) + 3(H_2O).$$

It will be observed that no mention is made of sulphuric acid in this equation, the presence of which is, however, essential in the production of gun-cotton, for although it takes no active chemical part in the action, it absorbs the water which is formed by the chemical transformation, and thus

keeps the nitric acid up to its full strength. Schönbein's discovery gave a great impetus to the question, and experiments continued to be made by many eminent chemists in nearly every country in Europe with the idea of utilising the new explosive for military purposes. It was first manufactured in England on a large scale in the year 1847 by Messrs Hall & Son of Faversham; but, in addition to minor accidents, a terrible explosion took place in their works, which created so much distrust that its manufacture in England was discontinued for several years, as the cause of the explosion, with the then imperfect knowledge possessed of the subject, could not be satisfactorily accounted for. The first country to turn Schönbein's discovery to practical account was Austria. General Von Lenk, an Austrian artillery officer, after extensive trials succeeded in greatly improving the method of manufacture, by which means he was enabled to moderate and ensure a uniform rate of combustion of gun-cotton in air; his discovery was considered of so much importance that in the year 1852 several batteries of Austrian artillery were armed with gun-cotton cartridges. But it soon fell into disrepute, not only on account of its unstable nature, but also because it was found that Von Lenk's improvements were of no practical utility when the gun-cotton was confined in the bore of a gun; the great heat generated caused the inflamed gas to penetrate rapidly through the whole cartridge, so that there was little or no retardation in the rate of combustion, and the rapid combustion caused excessive pressure in the bore, besides giving very unequal results when fired.

Since the failure of the Austrian cartridges gun-cotton has not been used as a propelling agent on a large scale. But its utility as a disruptive agent has been enormously increased by the discoveries of Professor Sir Frederick Abel and the late Mr E. O. Brown. Nothing daunted by the failure of the Austrian experiments, nor by the explosion at Messrs Hall's works, Sir Frederick Abel continued his experiments, and he ultimately discovered a method of manufacture whereby not only a complete purification from free acid is assured, but the material is converted into thoroughly compact homogeneous masses. As a result of his experiments the method of manufacture adopted in England may be briefly described as follows: the best white cotton waste alone is employed; this is first thoroughly cleansed from all grease by boiling with alkalies; it is then picked over by hand and all foreign substances removed, after which the fibre is separated and all knots and lumps opened out by passing the cotton waste through a 'teasing' machine; it is then cut into 2-inch lengths, thoroughly dried, and divided into charges weighing 1¼ lb. each, which are kept in air-tight tin boxes till ready for dipping. The acids used in the manufacture of gun-cotton are nitric acid having a specific gravity of 1·52 and sulphuric acid of 1·84 sp. gr.; these are mixed in the proportion of one part by weight of nitric acid to three of sulphuric acid, and allowed to cool down in iron tanks. The mixed acid is run off into the dipping pans into which a 1¼-lb. charge of cotton is immersed and left in for about five minutes, in which time it will have absorbed about 14 lb. of acid. The charge is now allowed to cool down, after which the waste acid is extracted by means of an 'acid-extractor,' and the charge thoroughly washed to remove all the free acid. It is now pulped and pressed under hydraulic presses to one-third its bulk, and moulded into slabs of various sizes and shapes for storing. The method of manufacture as here described is perfectly safe, as the gun-cotton throughout is in a wet state.

The properties of gun-cotton, as compared with gunpowder, are mainly as follows: (1) It can be ignited at a temperature of about 300°, whereas gunpowder requires a temperature of about 600° to ensure ignition; (2) its combustion leaves no solid residue, and is unattended by smoke; (3) the action of gun-cotton is much more rapid than that of gunpowder, and, as has already been pointed out, it is this rapidity of combustion which renders it unsuitable to be used as a propelling agent in cannon; (4) whereas gunpowder is greatly influenced and injuriously affected by moisture, gun-cotton on the contrary is perfectly uninjured, and may be kept for any length of time in water without change. For military purposes this is a most important consideration. Apart from the question of using gun-cotton as a propelling agent, its value for destructive purposes was incontestable, but it was thought to be necessary, in order to develop its full power, that the charge should be strongly confined. Experiments, however, conducted by Mr E. O. Brown clearly demonstrated the fact that compressed gun-cotton could be fully detonated in a totally unconfined state by fulminate of mercury. This discovery was thought to apply to dry gun-cotton only, but Mr Brown continuing his experiments ascertained that wet compressed gun-cotton could be detonated by using a small primer of the dry material. Still further discoveries were made with regard to the detonation of gun-cotton; it was ascertained that detonation, being established at one end of a continuous row of distinct masses of compressed gun-cotton, travels along the whole length of the row, even if a space of half an inch is left between the discs. These discoveries have raised gun-cotton to the highest rank as a military explosive, as the necessity for storing it in a dry state, which is so highly dangerous, is entirely obviated; it is now always stored in a wet state, the gun-cotton containing about 20 per cent. of water, and is packed in air-tight metal cases, so that the necessity for rewetting seldom occurs; in this condition it can be transported with perfect safety.

The discovery with regard to its detonation when in a wet state has led to this material being used as the charge for torpedoes and submarine mines. The first pattern of Whitehead torpedo was 14 feet long and 16 inches in diameter; the speed of the torpedo was 9 knots for 200 yards, and the charge was 118 lb. of compressed wet gun-cotton. Several subsequent patterns of torpedoes have been introduced, the latest being 14 feet long and 14 inches in diameter, and by reducing the charge of gun-cotton to 80 lb. the high speed of 27 knots for 600 yards has been attained. The immense importance of this increased speed can be readily appreciated, as it enables a torpedo to strike the vessel at which it is discharged before she has time to get out of the way. The torpedoes are fired by a striker actuated by a spring which is released on the torpedo striking the side of the ship; the striker is pointed, and penetrates a cap charged with 38 grains of fulminate; this cap is embedded in an 8 oz. disc of dry gun-cotton, enclosed in a hermetically sealed case, and placed as nearly as possible in the centre of the wet gun-cotton charge containing 12 per cent. of water. Gun-cotton is also used as the charge for submarine mines, the charge consisting of from 50 to 500 lb. of wet compressed gun-cotton.

There are various descriptions of marine mines. (1) *Ground mines:* in these the charge is contained in a case of sheet steel, with cast-iron sinkers attached to it to keep it at the bottom of the harbour or river; these mines are fired electrically by observation from the shore when an enemy's ship passes over them. (2) *Buoyant mines:* these are anchored a few feet below the surface of the water by a steel

rope attached to a sunken weight; they are connected with the shore by electric wires; a buoy with a signalling apparatus is attached to the mine, and when a ship strikes a buoy it rings a bell in the signalling room on shore; if the ship is a friendly one it is allowed to pass, but if it is an enemy's ship the mine is fired by electricity and the ship blown up. (3) *Electro-contact mines* these are used only in places where an enemy's ship would pass. When the mine is struck by a passing ship a steel spring or pendulum moves towards the point of impact and thus closes the circuit and fires the mine automatically.

A powder made by the Explosives Company, and generally known under the name of *E.C. Powder*, is another form in which gun-cotton can be used. There are two descriptions of this powder—viz. sporting and rifle powder; they are both essentially granulated gun-cotton, and consist of small rounded granules, the sporting powder being coloured orange with aurine, and the rifle powder yellow with picric acid.

Schultze Powder may be mentioned here as, although not strictly speaking a gun-cotton powder, it belongs to the class of explosive compounds not containing nitro-glycerine. The process of manufacture consists in macerating soft timber from which all resinous and fatty matter has been extracted by chemical means, the residue being pure finely-divided cellulose; this is saturated with nitric and sulphuric acids, and thoroughly purified by washing. The nitro compound thus formed is finely ground and waterproofed, and then sifted into the various sizes of grain required. Schultze powder has been manufactured since about the year 1860, but E.C. is a powder of more recent date. Both these powders are now largely used for sporting purposes. The great advantages they possess over the ordinary black powder are that an equal velocity is obtained with a very much smaller charge, that they do not foul the gun, and that they are nearly smokeless. But against this must be set the disadvantage that under certain conditions the strain on the breech of the gun is greater. But hitherto the results obtained from these powders when used in military firearms are not sufficiently uniform or regular to justify their adoption for military purposes. There can, however, be but little doubt that a smokeless powder of some sort will, before long, be universally adopted by all the great powers of Europe, not only for rifles, but also for artillery purposes; it is no longer a question as to whether a smokeless powder should be adopted or not, but which of all the smokeless powders experimented on is the best for adoption. Smokeless powders, in order to be suitable for military purposes, must not be too violent in their action, they must be able to stand extremes of heat and cold, they must not be very hygroscopic, and they must keep well in store without deteriorating in quality; and the problem to solve is to find a powder which will fulfil these conditions. Nearly all smokeless powders consist essentially of gun-cotton, or other lower forms of nitro-cotton, acted on by a solvent such as acetic ether or acetone, which reduces the nitro-cellulose to a viscid paste; the paste is then rolled out into sheets, and the solvent allowed to evaporate; the sheets are left as a dense horny substance, and are cut first into strips, and then the strips are cut crosswise into grains of any required size; or the substance can be left in strips or in a fibrous form.

The French, in 1887, were the first to adopt a smokeless powder for the cartridges for their new small-bore rifle, the Lebel. It is known as Vieille's powder, or 'Poudre B;' its exact composition has been kept a secret, but it is believed that picric acid is mixed with the paste as described above. The ballistics attributed to this powder when first introduced were remarkable; a charge of about 70 grains imparted a muzzle velocity of 2000 feet per second, to a bullet weighing 230 grains, fired from a rifle-barrel whose calibre was ·315″. But it was found that the powder rapidly deteriorated, and that these results were only attainable with recently manufactured powder. Hence in 1889 the French adopted another powder, the French B.N. Powder, the exact composition of which is kept secret.

The English government, after very exhaustive trials with various kinds of smokeless powders, eventually adopted in 1891 the powder known as *cordite* for use in Her Majesty's land and naval forces. The name comes from its being made in the form of string or cord, the size of the cord being dependent on the size of the gun for which it is required. It is a nitro-glycerine powder, and consists of 58 per cent. of nitro-glycerine, 37 per cent. of gun-cotton, and 5 per cent. of mineral jelly, acetone being used as a solvent. These ingredients are thoroughly mixed or incorporated in a machine, in which are two revolving blades somewhat in the form of the screw of a steamer. This process, which takes seven hours, converts the mixture into the form of a thick paste, the paste being the same for all sizes of cordite. For rifle cordite, the paste is pressed through a small hole, ·0375″ in diameter, in a cylinder, and is wound off on to reels, each reel holding 1 lb. of cordite. The cordite is then dried in a drying-room at a temperature of about 105° Fahrenheit to drive off the acetone, and in this form is ready for use for loading into rifle cartridge cases. For larger guns, the cordite paste is pressed through plates having holes of various diameters—the larger the gun the larger the diameter of the cord. The sizes at present in use for quick-firing guns are as follows:

For 3 and 4 pr. 2 ms.	diameter ·05″	length of cord	11 inches.
,, 12 ,,	,, 1 ,,	,,	11 ,,
,, 47 ,,	,, 2 ,,	,,	14 ,,
,, 6 ,,	,, ·3 ,,	,,	14 ,,

For heavier natures, the diameter varies from ·4″ to ·5″, and length of cord is also greater. The weight of a charge of cordite varies from one-half to two-thirds of that of black powder, and with this charge a higher velocity is obtained with a lower pressure.

The German military powder is also a nitro-glycerine compound. It is very similar to Nobel's *ballistite*, in which the proportion of nitro-glycerine and gun-cotton are about equal, benzol being used as a solvent; and instead of being pressed into cords, it is rolled under rollers into sheets, and then broken up into grains of various sizes.

The Smokeless Powder Company have also made a powder suitable for military rifles, called *rifleite*; as also a very good sporting smokeless powder known as S.S. These powders are made of nitro-cellulose in the form of nitro-lignine, the various shooting qualities being obtained by the mixture of the higher and lower nitrates of lignine, nitro-benzol being used as a solvent.

The following powders are extensively used for sporting purposes—viz.: *Ballistite*, already mentioned; *Cannonite*, which is a nitro-cellulose powder, the gun-cotton being dissolved in ether, and formed into a plastic mass, in which form it is pressed through a cylinder with very small holes in the bottom plate, somewhat in the form of rifle-cordite. These thin strings when dried are then broken into grains by being passed through revolving rollers. *Amberite* is another nitro-cellulose powder, the gun-cotton being mixed with paraffin and shellac. *Walsrode* is a German powder, and is a pure gelatinised nitro-cellulose. The gun-cotton being completely dissolved in solvents, the plastic mass being divided into grains by rotation in a barrel.

This powder is known as a condensed powder, the charge necessary to produce the required velocity occupying a very small space. The *Normal powder* is very similar to Walsrode.

One of the most powerful explosives known is *blasting gelatine*, made by dissolving 7 per cent. of gun-cotton in 93 per cent. of nitro-glycerine; it forms a gelatinous mass somewhat resembling honey in colour, and varying in consistency from a tough leathery material to a soft substance like stiff jelly. It is stronger than dynamite, as the nitro-cellulose itself is explosive, and, if made with great care, and if absolutely free from all impurities, is a safe and stable explosive. But, unless the ingredients of which it is composed are absolutely pure and free from all foreign matter, it becomes exceedingly dangerous when stored in large quantities, and is liable to spontaneous combustion.

See Wardell, *Gunpowder and Gun-cotton* (1889); Cundill, *Dictionary of Explosives* (1895); Eissler, *Modern Explosives* (1889); Guttmann, *Manufacture of Explosives* (1895); Sanford, *Nitro-Explosives* (1896). See also CELLULOID, RIFLES.

Gundamuk. See GANDAMAK.

Gun-factories, ROYAL, form one branch of the Royal Arsenal at Woolwich, the other two being the Royal Laboratory and Royal Carriage Department; see WOOLWICH. The process now adopted in manufacturing guns is explained under CANNON. The Elswick foundry was for some time recognised as an auxiliary and supplement to Woolwich Arsenal, the guns being turned out at a contract price, payable after rigid inspection. The close connection between them ceased in 1863, but many orders are still executed for government by the Elswick firm.

Gungl, JOSEF (1810–89), composer, born at Zsambek in Hungary, entered a military band as oboist, and was its conductor for eight years. In 1843–48 he gave concerts in Berlin, and there in 1849, after a visit to America, he was appointed director of the royal concerts. From 1858 to 1864 he was bandmaster of an Austrian regiment; but most of his remaining years were employed in concert tours. Of his 400 compositions most were waltzes or other dances.

Gun-metal. See CANNON.

Gunnel (*Centronotus*), a genus of coast fishes in the Blenny family, but with more elongate eel-like form than the true blennies. The British species (*C. gunnellus*), the spotted gunnel or butterfish, is common on British coasts, lurking under stones in tidal pools. The colour is deep olive, with a dorsal row of black spots surrounded by white rings; the usual length is about 6 inches; the skin is thickly coated with a mucous secretion. It is seldom used except for bait.

Gunner, in the British army, is a private soldier of the Royal Artillery. His pay is 1s. 2½d. per diem, except in the Horse Artillery, where it is 1s. 4d.; his uniform is blue with red facings, red stripes on the trousers, and yellow worsted lace. His arms consist of a carbine and sword-bayonet in the garrison artillery, and a cavalry sword in the horse. In the field artillery gunners carry no arms, but two carbines are strapped on to each limber. *Master-gunners* are warrant officers of artillery, generally placed in charge of one or more forts; the first class receive 6s., the second, 5s. 8d., and the third, 4s. 6d. a day. The office has much degenerated in importance since it was first created, at least as early as the time of Henry VIII.

In the *navy* the gunner is an officer from the ranks qualified in gunnery, appointed by warrant from the Admiralty. Rank next after chief-gunner, below second-lieutenant in the army, but above master-gunner. Pay, from 5s. 6d. to 8s. 3d., with allowances in special cases. Pension, at age of fifty-five or when unfit, not exceeding £120 a year. Must pass examinations on board gunnery ships at Portsmouth or Plymouth. Uniform similar to undress of sub-lieutenants, but without distinguishing marks, and with black-hilted sword. Duties: takes charge of all the ordnance stores on board ship, and is responsible under superintendence for their expenditure and account; has a general oversight of everything relating to the weapons employed and their proper use, either under a gunnery officer or where there is none. Is entitled to a cabin. Gunners are now sometimes appointed in place of sub-lieutenants for quarter-deck duties and to command torpedo-boats, &c. *Chief-gunner* is a commissioned officer promoted by selection from the gunners. Rank next after sub-lieutenants in the navy and with second-lieutenants in the army. Pay, 9s. per day, and pension at fifty-five or when unfit, not exceeding £150 a year. Uniform the same as gunner, but with a single gold stripe and loop on each cuff, the same as sub-lieutenant. Duties the same as those of gunner. Both chief-gunner and gunner are eligible for promotion to the rank of lieutenant in special cases. *Gunner's-mate* is a first-class petty-officer, selected after examination on board the gunnery ships from men qualified as seamen-gunners. Wages the same as other first-class seamen petty-officers, from 2s. 2d. to 2s. 5d. per day, but with extra pay for gunnery qualifications varying from 2d. to 8d. per day. Uniform the same as other first-class seamen petty-officers, but with devices on right sleeve denoting gunnery qualifications. Duties, assistant to those of gunner. *Chief-gunner's mate* is a chief petty-officer promoted from the gunner's-mates. Pay, from 2s. 8d. to 3s. 2d. per day, with extra pay for gunnery qualifications. Uniform, that of other seamen chief petty-officers, but with gunnery devices on right sleeve. Duties the same as gunner's-mates. *Seaman-gunner* is a seaman qualified in gunnery subjects on board one of the gunnery ships, for which he receives from 2d. to 4d. per day extra pay.

In the United States navy, gunners' wages, like those of boatswains and carpenters, range from $700 when on leave or waiting orders during the first three years' service, to $1800, when at sea after twelve years' service.

Gunnery is the science which governs by its laws the construction and employment of all fire-arms, though the term 'musketry' is generally applied to the scientific use of small-arms. It involves a knowledge of the properties of metals, and details of their manipulation in gun-manufacture, as well as the calculation of the strains to which the weapon will be subjected, the velocities of projectiles, and the effect upon them of the various forces to which they are exposed in the bore of the gun and during their flight through the air.

This subject was first treated of by an Italian mathematician, Nicolas Tartaglia, who in 1537 published *La Nuova Scientia*. He also invented the gunner's *quadrant*. Many other writers followed him, of whom the principal was Galileo, whose *Dialogues on Motion* were printed in 1638. But the real founder of the science was Benjamin Robins (q.v.), whose *New Principles of Gunnery* appeared in 1742, and treated of atmospheric resistance, the force of gunpowder, the effects of varying the length and weight of guns, &c. His invention, the Ballistic Pendulum (q.v.), enabled the velocity of a cannon-ball to be measured, and was generally used for that purpose until superseded by Navez's electro-ballistic pendulum about 1862. Euler, Halton, and others added by their

commentaries on Robins's work to the general knowledge of the subject which existed up to the end of the 18th century. In 1840 Professor Wheatstone invented an electric chronoscope for measuring velocities, which was followed by those of Navez-Leurs, Bashforth, Noble, and De Boulengé. In 1878–80 the Rev. F. Bashforth produced his chronograph for measuring the resistance of the air to the motion of elongated projectiles. By means of his tables and the various instruments now placed at their disposal, mathematicians are able to calculate the proper length, thickness of metal, size of chamber, charge, form of projectile and method of rotating it for a gun of given calibre, and also to determine the time of flight, penetration, height and velocity at any point, and elevation required for any range, &c. The latter are most necessary in order that the gun may be skilfully handled, and each weapon has its 'range table' made out, giving these particulars.

The official *Text-book of Gunnery* (1887), by Major Mackinlay, R.A., is one of the best modern treatises on this subject, and has been largely quoted in foreign works, notably in the *External Ballistics* of Captain Ingalls, U.S. Artillery.

In 1880 Major F. Siacci, of the Italian Artillery, put forward a method of solving trajectories and problems in ballistics, and his formulæ have been used by artillerists of all nations with very satisfactory results.

Without explaining the intricate calculations and delicate instruments used, it may be interesting to give a few examples of gunnery problems. A shot was fired at Shoeburyness in 1887, and called the Jubilee shot, from a 9·2-inch wire-gun at an angle of 40° elevation, by which it was thought an extreme range would be obtained. The calculated range was 20,765·3 yards (say 12 miles); maximum height, 17,110·6 feet; time of flight, 63·787 seconds; angle of descent, 53° 50′. The actual range was 20,236 yards.

The necessary elevation for a 12-inch 45-ton gun, firing with a charge of 295 lb. and a muzzle velocity of 1910 feet per second at a point 3000 yards distant and 1270 feet above it, is found to be 2° 25′. An 8-inch howitzer of 70 cwt. is to breach the escarp of a ditch 50 feet wide, with common shell and delay-action fuze—the angle of descent must be 14° and the striking velocity not less than 600 feet per second; required the least necessary distance of the howitzer from the escarp, the requisite charge of powder, and angle of elevation. Answer, 1936 yards, 6 lb. R.L.G.^{2} powder, and 13° 23′.

In designing a rifle of which the velocity is to be 800 feet per second at 1000 yards, and trajectory in no place higher than 32 feet, it is necessary to know the proportions of weight of bullet to calibre, which are found by Siacci's formulæ to be 358 grains for a calibre of ·38 inch, or 254 grains for ·32-inch calibre.

From these and similar examples it will be understood that gunnery has become one of the exact sciences. The excellence of modern machinery enables the manufacture of weapon, projectile, powder, and fuze to satisfy the demands of the theorists, while such inventions as Watkin's position and range finders and Scott's telescopic sights put it in the power of the trained artilleryman to show equally good results in practice. See BREECH-LOADING, CANNON, RIFLE; for the School of Gunnery at Shoeburyness, see ARTILLERY.

Gunny-bags are made of a coarse jute fabric (see JUTE), and are very largely exported from India to various parts of the world. American cotton is largely packed in these. They can be manufactured at a low price, hence the great demand for them. The name gunny is applied to the cloth as well as to the made-up bags. About 1850 the peasant hand-looms of Lower Bengal met both the home and the foreign demand for Indian-made gunny bags indeed the making of these was then the great domestic industry of that portion of India, giving occupation to men, women, and children of nearly every class. Even boatmen and domestic servants employed their spare moments at them. At the present time the number made at the great steam-factories, of which there are now twenty-three in India, far exceeds what is produced by hand-looms. For example, in the year 1885, 82,779,207 gunny-bags were exported from India, of which only five millions were woven by hand. In the same year forty millions of these bags were sent from Bengal to other parts of India, and it was estimated that nearly as many were used in Bengal itself. The total value of the Bengal trade in jute manufactures (mainly gunny-bags or cloth) in 1885 was believed to be not far short of £3,000,000. In India gunny-bags are employed for agricultural and internal trade purposes, but many are also sent out of the country filled with grain and other produce. Cloth and bags of the same kind are made in Dundee.

Gunpowder is a well-known explosive mixture composed of saltpetre, charcoal, and sulphur mixed together in certain proportions, somewhat varying in different countries and in different descriptions of powder.

The early history of gunpowder is very obscure; but there appears to be little doubt that the explosive nature of saltpetre (the great bulk of which comes either from India or China) when mixed with charcoal or carbon was known to the Chinese for many centuries before the Christian era. It may be assumed that the discovery of this property of saltpetre was accidental: a wood-fire lighted on the earth where saltpetre was mixed with the soil would bring the two ingredients together, and the action of the heat would be sufficient to show the nature or property of the mixture so brought about when raised to a certain temperature. It is certain that fireworks were known in China from very early periods; but in a pamphlet written by Colonel Omodei (Turin, 1834), and later in an article in the *Athenæum* of December 26, 1868, by Captain (now Lieut.-General) Henry Brackenbury, R.A., the question as to the first invention of gunpowder was fully discussed, and the conclusion arrived at was that there is great reason to doubt whether either the Chinese or any other Asiatic people invented gunpowder in its true sense, or were the first to use it as a propelling agent. It was left for more western nations to develop the discovery of the Chinese, and our first knowledge of the use of gunpowder as a military agent dates from the 7th century, when it was used by the Byzantine emperors, under the name of Greek Fire (q.v.), in the defence of Constantinople against the Saracens, who, discovering the secret of its manufacture, used it against the Crusaders, not however as a propelling agent, but in the form of rockets or liquid fire. Its first use in Europe as a propelling agent was in Spain, where both the Moors and Christians used some description of artillery as early as the 12th century. Roger Bacon first introduced it into England. Whether he discovered it independently of foreign aid, or whether he conceived the idea from ancient manuscripts, is uncertain; but the latter is the more probable, as the name first given to it was *crake*, presumably a corruption of the word *grec*. Bacon's discovery dates from a period early in the 13th century, but, owing to the crude and uncertain means adopted for mixing the ingredients, it was of no practical value till the German monk, Berthold Schwarz, introduced, somewhere about the year 1320, a method of manufacture by which the ingredients were thoroughly

incorporated; the meal powder thus made was first used in England as a propelling agent by Edward III. in his war against the Scotch in 1327, the tubes from which he propelled the shot being called *crakeys of war*. The same king subsequently used cannon at the battle of Crécy in 1346. From that date the use of gunpowder throughout Europe soon became general, the Russians, who in 1889 celebrated the 500th anniversary of its introduction into Russia, being the last to adopt it. Until the reign of Queen Elizabeth by far the larger quantity of powder required by the English was obtained from abroad; but in her reign its manufacture was introduced into England. The earliest English powder-mills of which there is any record were established at Long Ditton and Godstone, in Surrey, by George Evelyn (John Evelyn's grandfather) in 1590; the Faversham mills were started soon after this date, as were also those at Waltham Abbey. The mills at Faversham subsequently became the government powder-factory, and in 1787 the government also bought the mills at Waltham Abbey, which have remained in its hands down to this day. The Faversham mills were given up by the government after the peace of 1815; they were soon after bought by Messrs John Hall & Son, who still retain them.

The mode of manufacture adopted in England when these several powder-mills were all thoroughly established remained practically unchanged up to within the last thirty-five years. But before proceeding with a description of the manufacture and of the different powders now in use, it will be desirable to consider very briefly the part played by the several ingredients of which gunpowder is composed, and the chemical action which takes place on ignition. The saltpetre or nitrate of potash, KNO_3, acts as a magazine of oxygen, with which it readily parts when raised to a certain temperature. When the powder is fired, the oxygen of the saltpetre converts most of the carbon of the charcoal into carbonic acid, CO_2, a portion of which combines with the potash of the nitre to form carbonate of potash, KCO_3, the remainder existing in the state of gas, and the nitrogen is liberated. The sulphur, which performs the part of a second combustible in gunpowder, is for the most part converted into sulphuric acid, SO_3, and forms sulphate of potash. The reaction on firing the gunpowder may be expressed by the equation $KO,NO_5 + S + 3C = 3CO_2 + N + KS$. The heat generated by the explosion evolves a large quantity of elastic gases, the expansive power of which is greatly increased by the heat. The pressure being equal in all directions, the work done on the projectile in the bore of the gun is due to this elasticity and expansive force. The method adopted for measuring the amount of pressure in the bore of the gun will be dealt with hereafter.

Sir Frederick Abel, K.C.B., F.R.S., and Sir Andrew Noble, K.C.B., carried out two series of most exhaustive and complete experiments on fired gunpowder, and the conclusions they arrived at were communicated by them to the Royal Society in two papers (1875–80) under the head of 'Researches on fired Gunpowder.' The results are summarised as follows: when fired in a confined space (1) the products of combustion are about 57 per cent. by weight of ultimately solid matter and 43 per cent. of permanent gases; (2) the permanent gases occupy about 280 times the volume of the original powder; (3) the tension of the products of combustion when the powder entirely fills the space in which it is fired is about 6400 atmospheres, or 42 tons per square inch; (4) the temperature of explosion is about 4000° F.; (5) the chief gaseous products are carbonic acid, nitrogen, and carbonic oxide; (6) the solid residue is mainly composed of potassium carbonate, sulphide, and sulphate.

From the foregoing description of the part played by the nitrate of potash it might be thought that it would be highly advantageous to make gunpowder with some nitrate containing a larger percentage of oxygen than nitrate of potassium; and as a matter of fact there are a large number of nitrate mixtures other than gunpowder in which nitrate of sodium, barium, or ammonium are substituted for the nitrate of potassium. But unfortunately they are extremely hygroscopic, so that gunpowder made with them would, under ordinary circumstances, soon become useless on account of the damp it would absorb from the atmosphere. In a hot dry climate nitrate of soda powders would doubtless be valuable, besides being much cheaper to manufacture than nitrate of potash powders: indeed such powders were used to a considerable extent in the construction of the Suez Canal; but, as these powders are not in general use, it is unnecessary to refer to them further.

Process of Manufacture.—The method of manufacture of gunpowder at the Royal Gunpowder Factory at Waltham Abbey (fully explained in the official handbook) may be briefly described. As in all other explosives, it is essential that the ingredients of which the powder is composed should be as pure as possible. The selection and preparation of the charcoal is of the greatest importance; for, without any change in the proportions of the components, the properties of the gunpowder are capable of great variation from the quality of the charcoal used in its manufacture. The ingredients are first reduced to a fine powder by grinding. They are then mixed by hand in the proportion of 75 per cent. by weight of saltpetre, 15 of charcoal, and 10 of sulphur, and are next thoroughly incorporated in a wet state in a powder-mill into a cake called a mill-cake. This cake is then broken down between copper-plates into meal. From this meal-powder all granulated powders are made. The meal is compressed in a press-box, the amount of compression it undergoes being dependent on the density of powder required. After compression the press-cake is broken into pieces ready for granulating, which is done in the granulating machine, the powder passing between gun-metal rollers till it is broken into grains of the required size, different powders being made to pass through sieves whose meshes are of the size of the grain required. There is a considerable amount of dust formed by the granulating process, so that after granulating it is necessary to dust the powder previous to glazing it, which is the next operation. It is glazed in glazing drums, which, revolving rapidly, impart a glaze to the powder simply by the friction set up. The powder is now stoved or dried in copper-trays in a drying room, which is heated to a temperature of about 100° F., and the powder is left in this room from one to two hours according to the amount of moisture that it contains. Formerly all powder was granulated, but the enormous increase in the size of the guns now used necessitated the introduction of other descriptions of powder viz. *cut* and *moulded* powders. In the cut powders, after the process of *pressing*, the press cake, instead of being granulated, is first cut into strips, and these strips are then cut into cubes, and the powder so made is called cubical or pebble powder; there are at present two sizes—viz. ⅝-inch and 1½-inch cubes. In the moulded powders, as is implied in the name, each grain or piece of powder is moulded or pressed in a separate mould. This is done in a hydraulic machine. The exact quantity of granulated powder required to form each prism is deposited in a block containing sixty-four moulds; the powder in these

moulds is then pressed by plungers exactly fitting the moulds till the required density is obtained. This powder is called *prismatic powder*, the grains or pellets being in the form of hexagonal prisms nearly 1 inch in height and about 1⅛ inch across, with a hole in the middle about $\frac{1}{10}$th of an inch in diameter, the object of which will be explained later on. There are two descriptions of prismatic powder—black and brown. The proportions of ingredients in the black powder are the same as in all other English military powders; but in the brown powder the charcoal is made from straw, instead of from wood, and the proportion of the ingredients are as follows: viz. saltpetre 79, charcoal 18, and sulphur 3 per cent.

Gunpowder more nearly fulfils the objects required in a propelling agent than any other explosive hitherto discovered. These objects are (1) a maximum muzzle velocity with even and low pressures; (2) uniformity of action, so that the same results may always be expected; (3) freedom from fouling; (4) durability—i.e. that it is not liable to injury in transport, and that its condition does not materially alter when stored.

The advantages of gunpowder over other explosives are (1) that, the rate of combustion being gradual, the explosion is not so severe on the bore of the gun as in the case of more violent explosives; (2) the ingredients of which it is composed are easily produced and are cheap; (3) it is, with proper precautions, safe in manufacture, in store, or in transport. Experiments made by the Explosives Committee have shown that any alteration in the proportions of the ingredients has not so great an influence on the 'explosiveness' or rate of burning as the density, hardness, size, and shape of grain and amount of glaze. The density of grain has an important effect on the rate of burning. By absolute density is meant the amount of powder actually present in a certain bulk—i.e. if different quantities of meal-powder, containing an equal amount of moisture, be pressed into cakes of the same size, that which contains the most meal will be densest; then, if these cakes be ignited simultaneously, the cake which has the least density will be the first to be completely burnt. Hardness does not depend on density; increased hardness is given by pressing the meal in a moister condition. Size and shape of grain are also important characteristics to be considered in connection with the explosiveness of powder. Other things being equal, a larger-grained powder burns slower than a smaller-grained; and in grain of equal weight that which has the largest surface will burn the quickest. A highly-glazed powder, again, burns slower than an unglazed one, probably because the glaze somewhat retards its thorough ignition. The temperature at which powder ignites varies from 530° to 600° F., according to the nature of the powder, the finest sporting powder igniting at the higher temperature.

It is only of late years that all these points have received the attention they deserve, but they have been forced upon the authorities by the necessities of the times. As soon as ships began to be plated with armour, guns had to be made which could throw a projectile capable of piercing that armour; and as the armour increased in thickness so did the guns increase in size and power, throwing heavier projectiles, which necessitates an enormous powder charge to propel the shot. In former days there was a beautiful simplicity about powder. Practically there were but two kinds, one for muskets called fine grain or F.G., and the other for cannon called large grain or L.G., and no particular attention was paid to the quality; it was certainly not subjected to the searching proofs and tests which all powders made in these days have to undergo. The first improvement in powder took place on the introduction of rifled arms, when a rifle fine-grain powder or R.F.G., slightly larger in the grain than F.G., and a rifle large-grain powder or R.L.G., the grains of which were about twice the size of those of L.G., were introduced for small-arms and cannon respectively. The R.F.G. powder was improved and made of a rather smaller grain, the size of grain being from $\frac{1}{12}$th to $\frac{1}{20}$th of an inch, on the introduction of the Martini-Henry rifle, and this powder, known as R.F.G.^{2}, has not since been altered. But in cannon powder, or powder for large guns, the development has been great and continuous. When R.L.G. powder was introduced it was the largest grained and slowest burning powder then in existence in England; but as the guns were made larger and larger it became necessary to use a slower-burning powder, which led first to the introduction of R.L.G.^{2}, having grains varying in size from 3 to 6 to the inch; that is, the grains must pass through a sieve of 3 meshes to the inch, and must not pass through one of 6 meshes to the inch. A short time afterwards a still larger powder called R.L.G.^{4}, with grains of nearly half an inch in size, was introduced. This was soon followed by pebble powder, a still further development of R.L.G., for guns of large calibre for which R.L.G.^{4} was not suitable. The first pattern of pebble or P. powder was cut in cubes of about half an inch in size, and a second pattern or P.^{2} was made in cubes of about 1½ inch in size, with rounded edges. Both these powders have a density of 1·75, whereas that of the R.L.G. powders is 1·65. Next in order came the prismatic powders, of which there are two descriptions—viz. prismatic black or Prism^1 and prismatic brown or Prism^1 brown, a description of which has been given under the head of manufacture. There are two other powders of a special pattern which may be mentioned—viz. M.G.^{1} which is used only in the 1-inch Nordenfelt machine gun, the size of grain of which is considerably larger and of more even size than that of R.F.G.^{2}; and Q.F.^{1}, a powder which at present is used only in the 3- and 6-pounder quick-firing guns, the size of grains being about half an inch square by about $\frac{1}{10}$ of an inch thick.

The powders of other nations differ but slightly from those manufactured in England; the method of manufacture is the same in principle, but the proportions of the ingredients vary to a slight degree in every nation.

Having now described the various powders in use, it remains to say a few words about velocities and pressures. The great desideratum with all firearms is to obtain the maximum velocity with the minimum of pressure, and in the experiments and investigations carried out by the committee on explosives, and by Sir F. Abel and Sir A. Noble, this end was kept in view. It has already been pointed out that the rate at which powder burns depends greatly on the density, hardness, size, and shape of grain: the greater the density the slower it will burn; the larger the grain the slower it will burn, simply because the amount of lighting surface is reduced in proportion to the volume; and the smoother the surface of the grain the slower it will burn for the same reason. A powder therefore composed of, comparatively speaking, small grains of irregular size and shape, burns very rapidly, and generates a large volume of gas suddenly, thus setting up a very high pressure in the bore of the gun. In some of the experiments of the committee the pressure recorded in the bore of the gun was as high as 60 tons to the square inch; but, as Captain Noble had previously discovered that the maximum pressure of powder fired in a confined space did not exceed 42 tons, this extra pressure could only be due to wave-action, a sudden

evolution of gas locally causing a vibratory motion of the gas. This led to the introduction of larger-grained powders, so as to retard the burning of the charge, but this did not entirely do away with the wave pressure. It was next sought to diminish the pressure by giving air-space to the charge, as it was found that the density of the charge—not the density of the grain—materially affected the pressure; this air-space was given by enlarging the chamber of the gun, and although it became necessary to increase the charge so as to maintain the same muzzle velocity, it was found that the pressure was sensibly diminished.

But whilst Great Britain was still adhering to pebble powder, other nations had adopted a prismatic powder with a hole through the centre of the pellets or prisms. The idea of this perforated powder is due to General Rodman, an American artillery officer, who thought that by this means a charge of powder would evolve the gas at a more uniform rate. In a charge composed of solid grains, the grains being lighted on the surface and burning towards the centre, the surface giving off gas rapidly decreases, and therefore the volume of gas given off by the grain will be greatest when the charge is first fired, and will rapidly fall off; hence the maximum pressure on the bore of the gun is set up almost before the projectile commences to move. To overcome this, the idea occurred to General Rodman to have a hole through each large grain or pellet of powder, so as to give the grain an interior as well as an exterior lighting surface, so that as the exterior lighting surface *decreased* the interior lighting surface *increased*, thus preserving the ignited surface more uniform during the burning of the pellet, and therefore keeping up a more constant evolution of gas. This tends to distribute the pressure more uniformly along the bore of the gun, and increases the initial velocity of the projectile. The Russians in 1860 were the first to adopt this plan, followed by the Germans, the English being the last to take it up; it is now, however, adopted for the heaviest guns in the English service, the charge being built up of the hexagonal prisms already described, so arranged that the holes through each column of prisms shall be continuous from one end of the charge to the other. The introduction of this powder has enabled the type of gun to be entirely altered; a description of the guns now in the service will be found under the head of Cannon, Rifles (q.v.). We are indebted to the Germans for the invention of brown or cocoa powder; it is claimed for this powder that it gives a higher initial velocity with less pressure than the same charge of black powder.

The same principles as have been enunciated here with regard to guns should govern the selection of powder for mining or blasting purposes. If it is desired to shatter a mass of rock, a very violent quick-burning powder, having a great disruptive force, should be used; but if it is only desired to dislodge, say, a mass of coal without shattering it, a denser, slower-burning powder should be chosen.

The instrument generally used for taking velocities is a chronograph, the invention of Major De Boulengé of the Belgian Artillery. It consists of a brass column supporting two electro-magnets. No. 1 electro-magnet supports a long cylindrical rod, called the chronometer, covered by a zinc tube; No. 2 electro-magnet supports a shorter rod. Two screens of copper wire are placed at certain fixed distances in front of the muzzle of the gun. No. 1 electro-magnet is magnetised by the current passing through the first screen, and No. 2 by the current passing through the second screen. As the shot passes through the first screen the current is broken, and the rod or chronometer suspended by No. 1 electro-magnet falls by gravity. Similarly, when the shot passes through the second screen, the shorter weight suspended by No. 2 electro-magnet falls on to a disc, which, pressing a spring, causes a knife to be released, and this, darting forward, strikes the chronometer in its fall, making an indent in the zinc tube. The distance of this indent from the zero point being measured off on a scale specially graduated for the instrument gives the velocity of the shot between the two screens, from which can be calculated the muzzle velocity. Another scale gives the time of flight.

The pressures in the bore of the gun are calculated by means of a crusher gauge. A small copper cylinder is inserted in the gauge, which is screwed into the gun at that part where it may be desired to measure the pressure. The copper cylinder is measured before and after the discharge of the gun, the amount by which it is shortened by the force of the explosion being the measure of the force, or pressure, exerted. The actual pressure in tons to the square inch is calculated by means of a mathematical table prepared for different coppers.

See Wardell, *Gunpowder and Gun-cotton* (1889); Cundill, *Dictionary of Explosives* (1895); Eissler, *Modern Explosives* (1889); Guttmann, *Manufacture of Explosives* (1895); Sanford, *Nitro-Explosives* (1896). For Smokeless Gunpowder, see Gun-cotton, Rifles; and for laws relating to gunpowder, see Explosives.

Gunpowder Plot. This plot was an attempt on the part of a small number of Roman Catholic gentlemen to destroy by gunpowder King James I. and the Houses of Lords and Commons on the day of the opening of parliament, November 5, 1605. The design originated in the busy brain of Robert Catesby (q.v.), who had already suffered for the part taken by him in Essex's plot. He and his fellow-conspirators were driven to desperation by the faithlessness of James, who before his accession had led the Catholics to expect some measure of toleration, but soon afterwards put in full force the penal laws against popery, and showed a disposition to increase rather than to mitigate their rigour. Early in 1604 Catesby communicated his plan to John Wright and Thomas Winter. Guy Fawkes (q.v.), a brave soldier serving in the Spanish army, was brought over from Flanders, and together with Percy was admitted to the plot after taking an oath of secrecy. All five then received communion from the hands of the Jesuit Gerard, who, however, was not informed of the conspiracy. On 24th May Percy hired a room adjoining the Parliament House which they intended to undermine. The adjournment of parliament from time to time caused sundry postponements of the work. In December the digging was begun. The difficulties were greater than was expected, and it became expedient to call in the assistance of fresh associates—John Grant, Robert Winter (brother of Thomas), and Bates, a servant of Catesby. In the following March the conspirators were able to hire a convenient cellar immediately below the House of Lords. The mine was now abandoned, and the cellar was stored with casks of powder, covered with faggots.

All was ready by May. Money was now wanted to provide men, horses, and arms for the insurrection, which it was intended should break out in the midland counties, where the chief conspirators had congregated. So about Michaelmas some rich Catholics, Sir Everard Digby, Ambrose Rookwood, and Francis Tresham were induced to join. Tresham lacked the courage and fanaticism of his fellows. Wishing to save his friend Lord Monteagle, he wrote to him on Saturday, October 26, a mysterious letter, which was shown to Lord Salis-

bury and led to the discovery of the plot, if it had not otherwise been already betrayed. The names of the conspirators were, however, not disclosed. The government, therefore, waited for the fuller development of the plot. The cellar was visited as if casually by the Lord Chamberlain and Lord Monteagle at three o'clock on the afternoon of the 4th. Fawkes, who was found there, explained that the fuel and faggots were the property of his master, Percy. He still hoped to carry his design into execution, and a little before midnight he returned to the cellar to take up his post for the night. He was met and arrested at the doorway. Catesby hastened to Warwickshire, hoping to raise his friends. A few days later they were attacked; several of the conspirators, including Catesby, were killed, and others were taken prisoners and committed for trial. From their confessions the whole plot was gradually revealed.

The government was now much concerned with a suspicion that the murderous design had been promoted or approved by the Jesuits. Bates had in his confession implicated certain fathers of the society, especially Garnet (q.v.) and Greenway. The latter made good his escape abroad. Garnet and a brother Jesuit, Oldcorne, who was convicted of nothing more than aiding in the concealment of his companion, were discovered in a priest's hiding-place at Hindlip, whither Garnet had fled from Coughton, in the neighbourhood of the appointed rendezvous of the conspirators. Their trial excited the greatest interest. It soon became evident that Garnet's knowledge, such as it was, of the plot had been forced upon him by the conspirators, who were anxious to obtain from him some token of his approval for the satisfaction of their own doubtful consciences. He admitted that he had derived a general knowledge of some treasonable design against the government, in the first instance from Catesby, and that subsequently he had learnt the particulars from Father Greenway in confession. On further examination Garnet expressed some doubt whether the communication made by Greenway was strictly sacramental or under the seal of confession, or at least whether Greenway himself so considered it. It was, moreover, elicited from Garnet that he had frequent conversations with Greenway on the plot, though always 'in relation to confession.' Finally, when Catesby wished to give him full information out of confession—information which would have released Garnet from all shadow of scruple in taking measures to reveal or prevent the crime—the Jesuit refused to listen to him. Some of Garnet's actions, both before and after the 5th November, gave probability to the belief that he knew more than he admitted, and was not unwilling that the plot should succeed. He blamed himself, indeed, for not having done more to prevent the mischief, and declared that he should suffer, not as a martyr, but as a penitent thief. It is, however, clear that the clergy in general, whether secular or regular, and the entire Catholic community, with the exception of a score of fanatics, were innocent of all participation in the plot.

See the *Narrative of the Gunpowder Plot* by David Jardine (1857), which treats the facts in a masterly and impartial spirit; Gardiner's *History of England*, vol. i. chap. vi.; and Tierney's edition of Dodd's *Church History*, vol. ii. In 1896 Father Gerard, S.J., tried in *What was the Gunpowder Plot?* to show that the evidence of a real plot was slight, and that the plot was itself partly manufactured by government agents; in 1897 Gardiner traversed this theory in *What the Gunpowder Plot was*.

Güns (Magyar *Kőszeg*), a free town of Hungary, 57 miles SSE. of Vienna, with a castle of Prince Esterházy. Pop. 7070.

Gunter, Edmund, mathematician, was born in Hertfordshire in 1581, and educated at Westminster and Christ Church, Oxford. Although he took orders and became a preacher in 1614, his mind was strongly bent towards mathematical studies, and in 1619 he obtained the professorship of Astronomy in Gresham College, London, a post which he held down to his death, 10th December 1626. His principal works are the *Canon Triangulorum* (Lond. 1620), a table of logarithmic sines and tangents to seven places of decimals, being the first table published in accordance with Briggs's system, and treatises on the *Sector, Cross-staff, and other Instruments* (1624). Gunter was the first to use the terms cosine, cotangent, and cosecant for the sine, tangent, and secant of the complement of an arc. To him are also due the invention of the surveying-chain (see Chain), a quadrant, and a scale, and the first observation of the variation of the compass.

The name of *Gunter's Scale*, or *Gunter's Lines*, is usually given to three lines to be seen on almost any sector, and marked N, S, T, meaning the lines of logarithmic *numbers*, of logarithmic *sines*, and of logarithmic *tangents*. To understand their construction and use requires a knowledge of logarithms; they are explained in every school-book of practical mathematics. The distances of the divisions marked 1, 2, 3, &c. on the line of log. numbers, represent the logarithms of those numbers—viz. 0, ·301, ·477, &c.—taken from a scale of equal parts. The other lines are constructed on an analogous plan. Calling to mind that multiplication of numbers is effected by the addition of the logarithms, division by their subtraction, involution by their multiplication, and evolution by their division, we are able to perceive with what ease many *rough* problems in areas, heights, cubic contents, and other matters may be performed through the agency of Gunter's Scale.

Guntur', a town in the presidency of Madras, 46 miles WNW. of Masulipatam, with an active trade in grain and cotton. Formerly badly built and overcrowded, it has been recently much improved. Pop. 19,646.

Gurgaon, a district of the Punjab, in the division of Delhi, with an area of 1984 sq. m. Pop. (1891) 668,929, over two-thirds Hindus. Agriculture is the chief employment; the soil is on the whole not unfertile, but there is little artificial irrigation, and the district has suffered greatly from drought. The commercial centre is Rewari (q.v.); the civil headquarters is Gurgaon (pop. 4000), 21 miles SW. of Delhi by rail, with some trade in grain.

Gurhwal. See Garhwal.

Gurjun Balsam, or Wood-oil, a balsamic liquid obtained from one of the Dipteraceæ (q.v.), which grows plentifully in the Andaman Islands. It resembles in characters and medicinal properties Copaiba Balsam (q.v.), and has at various times been sold as such. It has been used as a substitute for copaiba, chiefly in the Indian hospitals, but its chief use in the East is as a varnish for boats, and for preventing the attacks of ants on timber. At the request of Mr Manley Hopkins, the Hawaiian consul, the English government procured from the government of India in 1888 a large quantity of gurjun-oil, for checking or alleviating leprosy in Hawaii. It was used for this purpose by the late Father Damien (q.v.) amongst the lepers of Molokai.

Gurnall, William, theological writer, was born in 1616 at Lynn, in Norfolk, was educated at Emmanuel College, Cambridge, and in 1644 became rector of Lavenham in Suffolk, where he died, 12th October 1679. He is known as author of the devout, quaint, and pithy sermons on Ephesians, chap. vi., entitled *The Christian in Compleat*

Armour: a Treatise of the Saints' War against the Devil (1655–62; see the ed. of 1865, with biography by Ryle).

Gurnard (*Trigla*), a genus of acanthopterous fishes of the family Cottidæ, represented in tropical and temperate seas by about forty species, of which seven occur on British coasts. The head of the gurnard is angular, the eyes near the summit, the upper surface and the sides entirely bony, the teeth small and very numerous. The body is rounded, tapering, and covered with small scales; the air-bladder is often in two lateral parts provided with lateral muscles, and the broad pectoral fins are usually brightly coloured on the inner surface. The most marked peculiarity of the genus is the presence, in front of the pectorals, of three free finger-like rays. These are well supplied with nerves, and are organs at once of locomotion and of touch. Most of the gurnards live near the bottom, and feed on crustaceans, molluscs, and small fishes. When handled they emit a peculiar sound caused by the escape of air from the air-bladder—a fact which has gained for one species (*T. lyra*) the local name of 'Piper.' The most common British species is the Gray Gurnard (*T. gurnardus*). Its colour is brownish-gray, marked with white, and the lateral line bears a series of white, crested, bony plates. The Red Gurnard (*T. pini*) is also common, and is much used as food. It attains a length of about

The Sapphirine Gurnard (*Trigla hirundo*).

15 inches. Much rarer is the Sapphirine Gurnard (*T. hirundo*), so named from the beautiful blue of its pectoral fins. It grows to a length of about 2 feet. Gurnards are caught by the trawling-net or by hook and line.

Gurney, Joseph John, a philanthropic Quaker, born at Earlham Hall, near Norwich, August 2, 1788, was educated privately at Oxford, and in 1818 became a minister of the Society of Friends. His life was devoted to benevolent enterprises, including the prison reforms of his sister, Mrs Fry. He died January 4, 1847. Among his works are *Prison Discipline* (1819), *Religious Peculiarities of the Society of Friends* (1824), and *A Winter in the West Indies* (1840). See Hare, *The Gurneys of Earlham* (1895).

Gustavus Adolphus (Gustavus II.), king of Sweden from 1611 to 1632, was born at Stockholm, December 9, 1594, the son of Charles IX., and grandson of the great Gustavus Vasa. He was carefully educated, and grew up one of the most accomplished princes of his age. He knew eight languages, speaking and writing five of these with fluency, was well read in the classics and ancient history, proficient in music, and skilful in all manly exercises. When he came to the throne in his eighteenth year he found the country involved in wars abroad and disorders at home, arising from the disputed succession of his father, who had been elected king to the exclusion of the direct heir, his nephew, the Roman Catholic Sigismund, king of Poland. The first act of Gustavus was to secure the hearty cooperation of the nobles, by confirming their privileges subject to the performance of military service to the crown. Having reorganised the internal government, and raised both men and money, he made war on Denmark, and soon recovered his Baltic provinces, and a direct outlet towards Russia. His war with Russia was ended in 1617, by the treaty of Stolbova, by which Sweden obtained supreme dominion over Ingermanland and Karelia, and part of Livonia, while Russia recovered Novgorod and all other conquests made by the Swedes. In 1618 Gustavus visited Berlin in secret and fell in love with the strong-minded daughter of the Elector of Brandenburg, whom two years later he married. On that second visit in 1620 he traversed Germany as far south as Heidelberg. He next turned more actively to the intermittent dispute with Poland, which was at length terminated in 1629 by a six years' truce, which secured reciprocity of trade and freedom of religion to the natives of both countries, and left Gustavus master of Elbing, Braunsberg, Pillau, and Memel.

This peace enabled the king to mature the plans he had long cherished in regard to Germany, and accordingly, after making various administrative reforms at home, he remitted the charge of the government and the care of his infant daughter Christina to his chancellor Oxenstiern, and crossed to Pomerania about the midsummer of 1630, with but 15,000 men, to head the Protestants of Germany in their hard struggle against the Catholic League, which was backed by all the power of the empire and the resistless arms of Tilly and Wallenstein.

Everything favoured the success of the Swedes, who drove the imperialists from Pomerania, and took Stettin. The Duke of Pomerania, the aged Boguslav, last of the old Wendish line, engaged, in return for Swedish aid, that the dukedom should, after his death, be given up to Sweden until the expenses of the war were fully repaid; whilst Richelieu promised Gustavus a substantial subsidy as long as he maintained an army of 36,000 men. The Emperor Ferdinand had been obliged by the Electors to dismiss the imperious Wallenstein from his service. But, while the Swedes were besieging Spandau and Küstrin, the rich city of Magdeburg, which had applied for help to Gustavus, who could not move without the support of the hesitating Electors of Brandenburg and Saxony, was taken by Tilly. His troops perpetrated the most terrible atrocities upon the citizens, and all the buildings were burned to the ground save the cathedral alone. The Protestant German princes had been slow in coming in to Gustavus; but after John George of Saxony was driven into his arms by the impolitic demands of Ferdinand, Gustavus came more and more to be identified as the champion of their religion against oppression. Meanwhile the unselfishness of his own aims and his elevation of character, as well as the admirable discipline and the conduct of his hardy veterans in such strong contrast to the ungoverned license of the imperial troops, gained the confidence and admiration of all Germany. Soon after the fall of Magdeburg, Gustavus inflicted a severe defeat on Tilly at Breitenfeld, which taught the Catholics to fear the 'snow-king and his body-

guard,' as they designated Gustavus and his small army. The king now advanced into Franconia, and, after allowing his army to recruit their strength in the rich bishoprics of Wurzburg and Bamberg, took the Palatinate and Mainz, where he held a splendid court, surrounded by numerous princes and ambassadors. In the April of 1632 the Swedes, in the face of Tilly's army, crossed the Lech and gained a decisive victory, whence Tilly was carried to Ingolstadt to die. From thence the march to Munich was one continued triumph, and wherever Gustavus appeared he was received by the populace as their guardian angel. The road to Vienna was now open to him, and the fate of the emperor would have been sealed had the latter not recalled his haughty general, Wallenstein, who, having accepted office on his own terms, gathered together a large and heterogeneous army of 60,000 men, and advanced on Nuremberg, where he entrenched himself strongly. After withstanding a desperate assault of the Swedes he was obliged to retire into Thuringia. The unfavourable season, the bad roads, and the cautious dispositions of Wallenstein hindered Gustavus from attacking the imperialists as soon as he intended, but on November 6, 1632, the two armies came finally face to face at Lützen, ten miles to the south-west of Leipzig. A thick fog lay close upon the ground. The Swedes gathered to morning prayer to the music of Luther's noble hymn, 'Eine feste Burg ist unser Gott.' About eleven the mist cleared off, and Gustavus gave his last orders to his generals. Waving his sword above his head he cried 'Forwards,' and rode to meet the enemy at the head of the cavalry on the right wing. His eager troops soon broke the imperial lines, but Wallenstein bringing up his reserves drove back the Swedish infantry in the centre. Gustavus hastened too eagerly to the rescue, and, in the thick fog which had again descended, was separated from the cavalry he had ordered to follow him, and rode almost alone into a squadron of Croats. A shot passed through his horse's neck, another shattered his left arm, a third struck him in the back, and he fell heavily to the ground. A cuirassier riding up asked who was there. 'I was the king of Sweden,' murmured the dying king, whereupon the soldier shot him through the head. Bernhard of Weimar took up the command, while on the enemy's side Pappenheim's cavalry came up to take their part in the battle. The Swedes burned to revenge their king and fought with a fury that was irresistible. Hour after hour the battle swayed uncertainly, till at length, when Pappenheim had fallen and his artillery had been taken, Wallenstein drew his men off the field and left their hard-won victory to the Swedes. The body of Gustavus was recovered and laid to rest in the Riddarholm church at Stockholm.

So fell the great hero of the Thirty Years' War, and with him perished all hope of a speedy ending to the fatal struggle, and the establishment of a durable peace in Germany. His *Corpus Evangelicorum* was a noble imagination, and would have built up a Protestant power around the shores of the Baltic so strong as to defy all attack. But it is more than probable that a foreigner even so disinterested as himself might have failed to overcome the instinctive cohesiveness of even a divided Germany, and if so, he was happy in the accident of death on the field of victory, leaving behind him a deathless glory undimmed by failure.

See books on Gustavus Adolphus by J. L. Stevens (1885), Trench (new ed. 1886), C. R. L. Fletcher (1890), Colonel R. A. Dodge (New York, 1896), and other works cited at THIRTY YEARS' WAR.

Gustavus Vasa (Gustavus I.), king of Sweden from 1523 to 1560, was born in 1496, of a noble house closely allied to the Sture family, his own family name being Ericson. Still a boy, he became involved in the patriotic struggle with Christian of Denmark, and was treacherously carried off to Denmark, there to be kept in confinement with other nobles as hostages. After a year he escaped in disguise to Lübeck, thence to Sweden, where he went about from place to place striving, with great danger to himself, and with but little success, to rouse up a spirit of resistance against the Danes. At length he had to retreat to Dalecarlia, where he wandered for several months, in poverty and disguise, with a price set on his head, working with his hands on the farms and in the mines. At last the infamous 'Blood-bath' of Stockholm (1520) roused the slumbering fury of the Swedes, and gave Gustavus the opportunity he longed for. The hardy miners of Dalecarlia mustered round him, and ere long he had an army large enough to attack the enemy. One by one the strong places fell into his hands, and the capture of Stockholm in 1523 finally drove the Danes from the soil of Sweden. Thus fell the great Scandinavian union which had survived the treaty of Calmar (1397) for 126 years. At the diet of Strengnäs that same year Gustavus was elected king. Thenceforward he strove with unceasing zeal to heal the wounds of his unhappy country. He found the peasantry restless and disaffected, the Romish clergy wealthy, corrupt, and unpatriotic, the Lutheran party too eager to push their dogmas by force, and the whole country demoralised without respect to law or religion. Yet after forty years' rule he left Sweden a peaceful and civilised realm, with a full exchequer, and with a well organised army of 15,000 men and a good fleet—both his own creations. He promoted trade at home and abroad, fostered schools and colleges, made commercial treaties with foreign nations, and established fairs for foreign traders, while he opened up roads, bridges, and canals throughout the country. In his relations with his subjects Gustavus was firm, and sometimes severe, but seldom unjust, except in his dealings towards the Romish clergy, whom he despoiled with something like rapacity of all their lands and funds. On the other hand he did much to promote the cause of Lutheranism; although he took care that the reformed clergy should be dependent on the crown, and enjoy only very moderate emoluments. To him the Lapps were indebted for the diffusion of Christianity among them by Lutheran missionaries; the Finns for the first works of instruction—parts of the Bible and hymn-books printed in their own language. Gustavus was methodical, just, moral, and abstemious in his mode of life—his character altogether admirable but for a touch of avarice. He was three times married, had ten children, and died 29th September 1560, his eldest son, Eric, being his successor according to the treaty of Westerås (1544), which made the crown hereditary. The best memoir is that by Fryxell—Ger. trans. *Leben und Thaten Gustavs I. Wasa* (1831). See also Alberg's *Gustavus Vasa and his Stirring Times* (Lond. 1882), and Paul Barron Watson's book, *The Swedish Revolution under Gustavus Vasa* (1889).

Gustavus III., king of Sweden, was born in 1746, and succeeded his father, Adolph Frederick, in 1771. At that time Sweden was ruled by an oligarchy of the nobles. The first task Gustavus set himself after his accession was to break their power and bring the supreme authority into his own hands; and this task he accomplished by means of a feigned revolt. Being of an energetic temperament and possessing a considerable share of political sagacity, Gustavus now laboured hard, and laboured successfully, for the progress of his

country, encouraging agriculture and bettering the lot of the peasantry, fostering commerce, mining, literature, and science, especially medicine, ordering the finances, digging canals, and building hospitals, orphanages, and workhouses. But he had an inordinate love for things French, and, in his endeavour to imitate the extravagance and splendour of the court of Versailles, he became embarrassed for money. His attempts to overcome this embarrassment by an increase of taxation alienated from him the affections of his people. Of this state of things the nobles took advantage; they thwarted the king's designs in his war with Russia, and endeavoured to recover the power they had lost (see SWEDEN). And, though Gustavus once more broke their opposition and made himself full master of his kingdom, an ill-advised scheme for employing the forces of Sweden in behalf of Louis XVI. of France against the storm of the Revolution led to his own assassination by Ankarström, an emissary of the oligarchical party, at Stockholm in March 1792.

Gustavus IV., king of Sweden, son and successor of Gustavus III., was born 1st November 1778. During the four years of his minority, his uncle, the Duke of Södermanland, acted as regent (1792–96). This king was altogether unfitted to rule a kingdom, owing to his crotchety notions of honour, his obstinate self-will, his exalted ideas of the prerogatives of kingship, and his want of tact and wisdom in the management of public affairs. The ruling principle or motive of his life was hatred of Napoleon. In consequence of this feeling he offended Russia by preferring the alliance with England, lost Stralsund and Rügen to the French, and Finland to the Russians in 1808, made an unsuccessful attack upon Norway, and finally insulted the English by his treatment of an army corps that had been sent to his assistance. In March 1809 the whole of Sweden was in a condition of burning discontent, and a party of nobles, acting in conjunction with the army, dethroned their wholly unpopular sovereign and gave the crown to his uncle, the Duke of Södermanland, who succeeded as Charles XIII. Gustavus spent his last days abroad, chiefly in Switzerland, often in great want, and died at St Gall, 7th February 1837.

Güstrow, a town of Mecklenburg-Schwerin, 70 miles E. by S. of Lübeck by rail. It has a castle (1558–65), a church of the 13th–15th century, and a noticeable pauper school and orphanage, with breweries, iron-foundries, a sugar-factory, tile-works, and a large wool market. It was for nearly a century and a half (1555–1695) the residence of the dukes of Mecklenburg-Güstrow. Pop. (1875) 10,923; (1885) 13,119.

Gut, a term technically used in zoology as equivalent to the enteron or alimentary canal. Three parts have to be carefully distinguished: (*a*) the fore-gut or *stomodæum*, lined by the outer layer or ectoderm, and formed from an anterior infolding or invagination; (*b*) the mid-gut or *mesenteron*, lined by the inner layer or endoderm, and formed from the original gastrula cavity; and (*c*) the hind-gut or *proctodæum*, lined by the outer layer or ectoderm, and formed from a posterior invagination. These three typical parts, thus distinguished according to their origin, vary greatly in size and function in different classes; but the mid-gut is the most important on account of its digestive function and because of its outgrowths (liver, &c.) in higher animals. It must also be noted that in vertebrate anatomy the pharynx, gullet, and stomach are sometimes called fore-gut; the small intestine, mid-gut; the large intestine, hind-gut; but embryologically these are all parts of the mesenteron defined above. See EMBRYOLOGY; and for the gut manufacture, CATGUT.

Gutenberg, JOHANNES, or HENNE, who is regarded by the Germans as the inventor of the art of employing movable types in printing, was born about 1400 at Mainz. He was apparently the illegitimate son of a canon named Gensfleisch, and so adopted his mother's family name. In 1434 he was living in Strasburg, and seems to have been well known as a man of considerable mechanical skill, who taught stone-cutting, mirror-polishing, and similar arts. When and where he made his first attempts in the art of printing cannot with certainty be ascertained. Some time between 1444 and 1448 he returned to Mainz, where, in 1449 or 1450, he entered into partnership with Johannes Faust or Fust, a wealthy goldsmith, who furnished the money required to set up a printing-press. This partnership was, however, dissolved after the lapse of a few years (1455), Faust bringing an action at law against Gutenberg to recover the sums he had advanced. In consequence of the legal verdict Faust retained the printing concern, and carried it on in conjunction with Peter Schöffer of Gernsheim. Gutenberg, with the assistance of a Dr Homery, afterwards set up another printing-press, with which he worked on till the date of his death, 1468. For authorities and an account of the invention controversy, see PRINTING.

Guthrie, SAMUEL, an American chemist, was born in Brimfield, Massachusetts, in 1782. He deserves notice as one of the original discoverers of Chloroform (q.v.), which he termed a 'spirituous solution of chloric ether.' His process was tested as early as 1831. He died at Sackett's Harbour, New York, 19th October 1848.

Guthrie, THOMAS, D.D., an eminent pulpit and platform orator, philanthropist, and social reformer, was born July 12, 1803, at Brechin, Forfarshire, where his father was a merchant and banker. He studied eight years for the ministry at the university of Edinburgh, and devoted two additional winters to the study of chemistry, natural history, and anatomy. Meanwhile he was licensed as a preacher by the presbytery of Brechin in 1825. He subsequently spent six months in Paris, studying comparative anatomy, chemistry, and natural philosophy, and walking the hospitals there. Returning to Scotland, he for two years conducted, on behalf of his family, the affairs of a bank agency in Brechin. After waiting for five years for a presentation to a living, he had almost resolved to abandon the clerical profession when, in 1830, he received a presentation from the crown to Arbirlot, in his native county; and in 1837 was appointed one of the ministers of Old Greyfriars parish in Edinburgh. Here his eloquence, combined with devoted labours to reclaim the degraded population of one of the worst districts of the city, soon won for him a high place in public estimation. In 1840 he was chosen minister of St John's church; he declined calls to London and India. In 1843 Guthrie joined the Free Church, and for a long series of years continued to minister to Free St John's—a large and influential congregation in Edinburgh. In 1845–46 he performed a great service to the Free Church, in his advocacy throughout the country of its scheme for providing manses or residences for its ministers, and raised in less than twelve months £116,000 for this object. Guthrie's zeal, however, was not diverted into mere denominational or sectarian channels. He came forward in 1847 as the advocate of Ragged Schools (q.v.) by the publication of his first *Plea for Ragged Schools*. He was not, as sometimes stated, the founder of the Ragged Schools, but rather the apostle of the

movement. A Ragged School was founded on the Castle Hill, in 1887 removed to Liberton. He also earnestly exerted himself, in many ways, in opposition to intemperance and other prevailing vices, and in favour of national and compulsory education. He became a total abstainer in 1847 through a conversation with an Irish car-driver. Guthrie possessed great rhetorical talent; and his style was remarkable for the abundance and variety of the illustrations he used. Lord Cockburn attributed Guthrie's remarkable influence over his audience to the possession of 'passion and compassion.' Few public speakers have ever blended solemnity and deep pathos so intimately with the humorous, his tendency to which, although never in the pulpit, has more frequently than anything else been pointed out as his fault. Guthrie always displayed a generous sympathy with all that tends to progress or improvement of any kind. He was moderator of the General Assembly of the Free Church of Scotland in May 1862, and one of the vice-presidents of the Evangelical Alliance. He was presented with £5000 in 1865 as a token of public appreciation. He acted as editor of the *Sunday Magazine* from its establishment in 1864, in which year he retired from his regular ministrations. He died 24th February 1873. Guthrie's most important published works are *The Gospel in Ezekiel* (1855); *The Way to Life* (1862); *A Plea for Drunkards and against Drunkenness* (1850); *A Plea for Ragged Schools*, a pamphlet (1847), followed by a second and a third plea, the latter under the title of *Seed-time and Harvest of Ragged Schools* (1862); *The City: its Sins and Sorrows* (1857); *Man and the Gospel* (1865); *Angels' Song* (1865); *Parables* (1866); *Studies of Character* (1868); *Sundays Abroad* (1871). See his *Autobiography and Memoir*, edited by his sons (2 vols. 1874–75); and a small Life by O. Smeaton (1900).

Guthrie, WILLIAM, a political, historical, and miscellaneous writer, was born at Brechin, in Forfarshire, in 1708, and educated at King's College, Aberdeen. At an early period he removed to London, where he worked hard for forty years as a man of letters. He died in March 1770. Among his various works are a *History of England* (3 vols. 1744–50), and *A Historical and Geographical Grammar* (1770; 24th ed. 1827), a useful manual of information, which long enjoyed immense popularity.

Guthrum. See ALFRED THE GREAT.

Guts Muths, JOHANN CHRISTOPH FRIEDRICH, a German teacher, was born at Quedlinburg, in Prussian Saxony, 9th August 1759, studied at Halle, and from 1785 to 1837 taught gymnastics and geography in Salzmann's scholastic institution at Schnepfenthal. He died 21st May 1839. He is specially remembered for having introduced gymnastics as a branch of education in German schools. On this subject and on geography he wrote numerous text-books, as *Gymnastik für die Jugend* (1793) and *Handbuch der Geographie* (1810); he also edited *Bibliothek für Pädagogik* (1800–20) and, along with Jacobi, *Deutsches Land und deutsches Volk* (1820–32). See his life by Wassmannsdorf (Heidelb. 1884).

Gutta-percha, a substance in many respects similar to caoutchouc, is the dried milky juice of various trees of the order Sapotaceæ; the chief is apparently that called by Hooker *Isonandra Gutta*, and by Bentley and Trimen *Dichopsis Gutta*. The tree, which is found in the peninsula of Malacca and the Malayan Archipelago, is very large, attaining a height of 70 feet; the trunk is sometimes 3 or even 4 feet in diameter, although it is of little use as a timber-tree, the wood being spongy. The leaves are alternate, on long stalks, obovate-oblong, entire, somewhat leathery, green above, and of a golden colour beneath. The flowers are in little tufts in the axils of the leaves, small, each on a distinct stalk, the corolla having a short tube and six elliptical segments; they have twelve stamens and one pistil. The name, gutta-percha (*gutta percha*, or *gittah pertja*, is Malay. There are two or three kinds of gutta-percha known in commerce, and it is more than probable these are

Gutta-percha (*Isonandra* (*Dichopsis*) *Gutta*): *a*, a flower; *b*, fruit

yielded by different species. That from Singapore is esteemed the best, and is distinguished by the Malay traders as *Gutta Taban* or *Tuban;* that of Borneo is of less value—this is called *Gutta Percha* by the traders, and has given the general name to all; and another kind goes by the name of *Gutta Girek*. The first two are those generally known in our markets. The former mode of obtaining the gutta-percha was a most destructive one. The finest trees were selected and cut down, and the bark stripped off; between the wood and bark a milky juice was found, which was scraped up into little troughs made of plantain leaves. Now the plan of tapping the living trees is employed. The juice soon coagulates, or may be boiled, and is then kneaded by hand into oblong masses a foot in length.

Gutta-percha was known in Europe long before its peculiar characteristics and uses were known. It was brought home at various times by voyagers, in the forms of drinking-bowls and native shoes; and was thought by some to be a species of india-rubber, while others asserted it was a kind of wood, which they named *mazer-wood*. But for its introduction in 1843 we are indebted chiefly to Dr William Montgomerie of the Indian Medical Service, who was rewarded with the gold medal of the Society of Arts. He first noticed that the Malays used it for making handles to their knives, &c., and it immediately occurred to him that it might be of great use in a variety of ways, especially in making handles for surgical instruments, the hand being able to get a light but firm grasp of them. Soon the importation of gutta-percha increased amazingly; in 1860 it exceeded 16,000 cwt. In 1864, 1865, 1870, and 1871 the imports varied from 25,966 cwt. to 35,636 cwt.; in 1876–83, from 21,100 cwt. to 66,000 cwt. Down to 1888 these imports declined very much, as in that year they only reached 22,500 cwt., at an average price of 162 shillings per cwt. In 1889, however, they showed an upward tendency both in quantity and value, the total imports from January to October 1889 being 38,940 cwt., and the average price 241 shillings per cwt. By far the

greatest portion of it is imported from the East Indies.

Its most important application has been in the coating of marine electric telegraph wires. In this application, as in most others, its inherent defect, arising from the readiness with which it becomes oxidised and decomposed, has manifested itself seriously, and it is greatly affected by age in its resisting qualities. Hence substitutes of greater stability have been looked for. Many of these have been forthcoming, india-rubber being used now to a large extent, as also a composition produced from asphalt, balsam of sulphur, &c., and other compounds. Gutta-percha is used for making a vast variety of useful and ornamental articles. Among others the following may be mentioned: golf-balls (very extensively), overshoes (more in America than in Britain), beltings for machinery, pump-buckets, sheeting, tissue, thread or whip cord, and tubing. A very large trade is done in shoe soles. It is turned by surgeons to various uses, chiefly for splints and moist coverings to retard evaporation. It has also been used for stopping hollow teeth.

The great value of gutta-percha arises from the ease with which it can be worked, and its being so complete a non-conductor of electricity. It softens in warm water, and can be moulded into any form in that state, as when soft it is not sticky and turns well out of moulds. It will always be of great value as a material in which to take casts, as it can in the soft state be made to take the sharpest forms most faithfully; and, as it quickly becomes hard, and preserves its shape if not too thin, the range of its utility in this respect is very extensive.

It is imported in blocks and lumps of five to ten pounds weight, in various forms, chiefly like large cakes, or rounded into gourd-like lumps. It has a very light reddish-brown, or almost a flesh colour, is full of irregular pores elongated in the direction in which the mass has been kneaded. It has a cork-like appearance when cut, and a peculiar cheese-like odour. Before it can be used it has to undergo some preparation. This consists in slicing the lumps into thin shavings, which are placed in a *devilling* or tearing machine revolving in a trough of hot water. This reduces the shavings to exceedingly small pieces, which, by the movement of the tearing-teeth, are washed free from many impurities, especially fragments of the bark of the tree, which, if not separated, would interfere with the compactness of its texture—one of its most important qualities. The small fragments, when sufficiently cleansed, are kneaded into masses; and these are rolled several times between heated cylinders, which press out any air or water, and render the mass uniform in texture. It is then rolled between heated steel rollers into sheets of various thicknesses for use, or is formed into rods, pipes for water, speaking-tubes, or any of the innumerable articles which may be made of it.

Gutta-percha differs very materially from caoutchouc or india-rubber in being non-elastic, or elastic only in a very small degree. Notwithstanding this very striking character of caoutchouc, the two articles are very often confounded in the public mind.

Gutta Rosea, old name for Acne Rosacea (q.v.).

Gutta Serena. See AMAUROSIS.

Guttiferæ, or CLUSIACEÆ, a natural order of exogenous plants, consisting of trees and shrubs, natives of tropical countries, very generally secreting an acrid yellow resinous juice. A few are epiphytes. The leaves are opposite, destitute of stipules, leathery, and entire. In botanical characters this order is allied to Hypericinæ. It contains about 150 known species, the greater part of them South American, although all tropical countries produce some. The resinous secretions of some are valuable, particularly of those trees which yield Gamboge (q.v.) and Tacamahaca (q.v.). See also CLUSIA.—A few species afford valuable timber. See CALOPHYLLUM.—The flowers of some are very fragrant; those of *Mesua ferrea* are found in a dried state in every bazaar in India, and are used as a perfume.—The fruit of some is very highly esteemed; the Mangosteen (q.v.) has been described as the finest fruit in the world. The Mammee Apple (q.v.) is another of the most celebrated tropical fruits.

Gutzkow, KARL FERDINAND, German writer, born at Berlin, 17th March 1811. Whilst preparing for the calling of gymnasium teacher he became profoundly influenced by the French Revolution of 1830, and in 1831 he joined the critic Menzel in Stuttgart, and helped him to edit the *Litteraturblatt*. This his introduction to serious literary work led to the publication in 1832 of the satirical romance *Maha-Guru*, and in 1835 of *Wally, die Zweiflerin*. For this last Gutzkow was imprisoned for three months, his book being confiscated and himself forbidden to publish any work within the states of the Confederation—the author having revealed himself in his book as an ardent champion of the 'Young Germany' movement, the object of which was to oppose romanticism and advocate in place of it all those revolutionary ideas which are in their character essentially and peculiarly modern. As soon as he obtained his release he entered upon a period of restless and migratory activity as a journalist, until in 1847 he became director of the Court Theatre at Dresden. In the meantime he had written some successful dramas, *Richard Savage* (1839), *Zopf und Schwert* (1844), *Das Urbild des Tartüffe* (1847), *Uriel Acosta* (1847), besides *Werner, Ottfried, Der Königsleutnant*, and many others which won only dubious recognition. He also wrote some romances of considerable merit, as *Die Ritter vom Geiste* (9 vols. 1850–52), *Der Zauberer von Rom* (9 vols. 1858–61), *Hohenschwangau* (5 vols. 1867–68), and *Kleine Narrenwelt* (1856), a collection of short stories. In 1864 Gutzkow, whilst suffering from a nervous mental disorder, made an unsuccessful attempt upon his own life. This malady returned in 1873, and after a visit to Italy he settled at Sachsenhausen, near Frankfort-on-Main, where he died, 16th December 1878. Gutzkow possessed a keen instinct for the spiritual fermentations and conflicts and the intellectual problems of his time, and in his literary productions could not sufficiently subordinate his interests to the proper canons of art. These didactic and critical phases of his temperament spoil most of his best books, except perhaps *Uriel Acosta*. Apart from this failing, and the great length of some of them, those same books exhibit much excellent character drawing, much keen analysis of motives, a penetrating insight into the tendencies of current thought, clever dialogues, and skilful and dramatic arrangement of situations and scenes. His *Gesammelte Werke* have been issued in 32 vols. (Jena, 1873 *sq.*).

Gützlaff, KARL FRIEDRICH AUGUST, German missionary to China, was born at Pyritz, in Pomerania, 8th July 1803. Going out to the East under the auspices of the Dutch Missionary Society, he spent two years in Batavia learning Chinese. Then, in 1828, he proceeded to Bangkok, capital of Siam, where he translated the Bible into Siamese. Finally, in 1831, he reached the goal of his aspirations—China. During the rest of his life he lived mostly at Macao and Hong-kong, occupying himself with a translation of the Bible into Chinese, with

writing various books in Chinese, German, and English, with publishing a monthly magazine in Chinese, and above all (from 1844) with the training of native preachers to carry the gospel into the interior, for at that time foreigners were not allowed to enter the empire. He rendered valuable assistance to the British during the war of 1840-42 and the subsequent negotiations for peace. He died at Hong kong, 9th August 1851. He published a *Journal of Three Voyages along the Coast of China* (Lond. 1834; Ger. trans. 1835); *China Opened* (1838); *The Life of Tao-Chang* (1838); and a history of China in German (1847), besides addresses, reports, &c.

Guy, Thomas, founder of Guy's Hospital (q.v.), Southwark, London, the son of a lighterman and coal-dealer, was born in Fair Street, Horselydown, near the Thames, in 1644. He began business in 1668 in the angle formed by Cornhill and Lombard Street, as a bookseller with a stock of about £200, dealing extensively in the importation of English Bibles from Holland (those printed at home being executed very badly); and, on this being stopped, he contracted with the university of Oxford for the privilege of printing Bibles, which he continued to do for many years. By this means, and by selling out his original shares in South Sea Stock at a great advantage, he amassed a fortune of nearly half a million sterling. In 1707 he built and furnished three wards of St Thomas's Hospital. For the building and endowment of the hospital in Southwark which bears his name he set apart £238,295, 16s. He was also a liberal benefactor to the Stationers' Company, and built and endowed almshouses and a library at Tamworth, for which he became one of the members about 1694. Besides bestowing £400 a year on Christ's Hospital, and giving to various other charities, he left £80,000 to be divided among those who could prove any degree of relationship to him. He was of mean appearance, with a melancholy countenance, and was regarded as an intensely selfish and avaricious man. He died December 27, 1724.

Guy de Lusignan. See Cyprus.

Guy of Arezzo. See Guido Aretinus.

Guy of Warwick, the hero of one of the most ancient and popular of our early English metrical romances. It is a purely English story of the 13th century, related to the Dano-Saxon romance of *Havelok* by its allusions to Danish wars in England, and to the French *King Horn* by its adoption of some of the more striking incidents in that story. Its authorship may be due to Walter of Exeter, a 13th-century Franciscan monk, but it has undoubtedly been improved by some French or Norman minstrel. The story has close affinity with that of Guido Tyrius in the *Gesta Romanorum*. The hero, Sir Guy of Warwick, is son of Segard, steward of Rohand, Earl of Warwick; his instructor in the exercises of chivalry, the famous Héraud of Ardenne. Having fallen deeply in love with Felice, the fair and accomplished daughter of the earl, he fell into a grievous sickness, but was recalled to life by a promise of her hand when he had earned it by knightly deeds. Immediately he crossed to Normandy, at the great tournament of Rouen vanquished every competitor, and at once set out into far lands, travelling through Spain, Almayne, and Lombardy, and gaining the prize in every tournament. He then returned to England, and overcame the famous Dun Cow on Dunsmore Heath, near Warwick. But his haughty mistress was still unsatisfied. Once more he left his country to traverse Flanders and Italy, and here he well-nigh lost his life through the treachery of Otho, the 'felon duke' of Pavia. He next went to Constantinople to save the Emperor Ernis from the Saracens, slew the mighty Coldran, cousin of the soudan, and scattered his huge army. The grateful emperor pressed on him the hand of his lovely daughter and heiress Loret, but, faithful to Felice, Sir Guy tore himself away, and returned, with many adventures by the way, to his native country. No sooner had he reached its shores than tidings were brought of a most portentous dragon then ravaging Northumberland. He hastened to meet the monster, slew him, and carried his head to King Athelstan, at Lincoln. The fair Felice had now no scruple to marry the hero. But remorse for all the slaughter he had done merely for a woman's love began to seize him, and after forty brief days of wedded happiness he left his home in the dress of a palmer to visit the Holy Land. Here he rescued Earl Jonas from his dungeon, and slew the ferocious giant Amiraunt, after which he returned to England to find Athelstan besieged in Winchester by the Danish Anlaf, of whose army the mainstay was the terrible Colbrand. Sir Guy, still in his disguise, after a prolonged and awful struggle, succeeded in striking off the champion's head. He now visited his wife all unknown in his palmer's weeds, and then retired to a hermitage at the place still called Guy's Cliff, near Warwick. Before his death he sent her parting ring as a token to Felice, and she arrived in time to close his eyes, survived him for but fifteen days, and was buried in the same grave.

An edition in French prose was printed at Paris in 1525; the earliest English edition is undated, but most probably appeared about 1550. The earliest English MS., that of Auchinleck, was printed for the Abbotsford Club in 1840; and again, together with the Caius MS., by Professor Zupitza for the Early English Text Society (1883-87). A 15th-century version had already been edited for the same society by Zupitza (1875-76). All these MSS. have most probably been translated from the Anglo-French version. See J. Zupitza, *Zur Literaturgeschichte des Guy von Warwick* (Vienna, 1873); A. Tanner, *Die Sage von Guy von Warwick* (1877).

Guyon, Jeanne Marie Bouvieres de la Mothe, French mystic, was born at Montargis (dept. Loiret), 13th April 1648. She had destined herself for the cloister, but was married, when sixteen years of age, to Jacques Guyon, a man of great wealth, but much older than herself. Being, however, left a widow at twenty-eight, she determined to devote her life to practical ministrations to the poor and needy, and to the cultivation of spiritual perfection, or an endeavour to realise the consummate achievements of the inner life, for herself. The former part of her plan she began to carry out in 1681 in the neighbourhood of Geneva, where she found a sympathetic coadjutor in Father La Combe. But three years later she was compelled to depart thence on the ground that her Quietist doctrines were heretical (see Quietists). At Turin, Grenoble, Nice, Genoa, Vercelli, and Paris, where she finally settled in 1686, she became the centre of a religious movement for the encouragement of 'holy living.' But in January 1688 she was arrested for having taught heretical opinions, and for having been in correspondence with Molinos, the leader of quietism in Spain. Released by the intervention of Madame de Maintenon, after a detention of nine months, she soon afterwards became acquainted with Fénelon; but, her influence spreading, she was again imprisoned in 1695. Out of a commission appointed to inquire into her teachings and conduct of life arose a controversy between Fénelon (q.v.) and Bossuet. Madame Guyon was not released from the Bastille until 1702. The remainder of her life was spent in retirement at Blois, where she died, 9th June 1717. Her views find best expression in her works entitled

Les Torrens Spirituels, *Moyen Court de Faire Oraison*, and *Le Cantique des Cantiques interprete selon le sens mystique*. She also wrote an autobiography and letters, as well as some spiritual poetry. Her collected works appeared in 40 vols. in 1767-91. See Upham, *Life and Religious Opinions of Madame Guyon* (New York, 1847), and Guerrier, *Madame Guyon* (Orleans, 1881).

Guyon, Richard Debaufre, a general in the Hungarian revolutionary war, was born at Walcot, near Bath, 31st March 1813. His father, a commander in the English navy, was the descendant of a Huguenot family that settled in England after the revocation of the Edict of Nantes. Guyon entered the Austrian service in 1831; and married the daughter of a Hungarian baron and field-marshal in 1838. From that time till the outbreak of the revolution, Guyon led the life of a country gentleman on his estates near Komorn, but was one among the first to offer his services to the national government, and acted a prominent part in the struggle for independence. During the retreat of Görgei's army, Guyon carried the mountain-pass of Branyiszko, and by that daring feat re-established the communication with the government at Debreczin, as also with the several other Hungarian army corps. He did brilliant service at Kapolya, Komorn, and elsewhere; and after the end of the war escaped to Turkey, and entered the service of the sultan, without being obliged to turn Mohammedan. Under the name of Kourshid Pasha, he, as a general of division, was governor of Damascus, and at the beginning of the Crimean war did much to organise the army of Kars. He died at Constantinople, 12th October 1856. See A. Kinglake, *General Guyon* (1856).

Guyot, Arnold, geographer, was born in Switzerland in 1807, took the degree of Ph.D. at Berlin in 1835, was the colleague of Agassiz at Neuchâtel in 1839–48, and in 1848 accompanied him to America. Guyot delivered a course of lectures at the Lowell Institute, which were translated by Professor Felton (q.v.), and published as *Earth and Man* (1853). In 1854 he was appointed professor of Physical Geography and Geology at Princeton, where he died, 8th February 1884. He had the management of the meteorological department of the Smithsonian Institution, where he more than once delivered courses of lectures, and in connection with which he published *Meteorological and Physical Tables* (revised ed. 1884). Guyot was joint-editor of *Johnson's Cyclopædia* (1874–77), and his other works include several biographies, a *Treatise on Physical Geography* (1873), and a series of geographies and wall-maps which are in general use in American schools.

Guy's Hospital was founded by Thomas Guy (q.v.), who leased from the governors of St Thomas's Hospital a large piece of ground, for a term of 999 years, at a ground-rent of £30 a year. The space being cleared, the first stone of the building was laid in 1722, and the hospital admitted its first patient in 1725, a few days after the death of its founder. The whole expense was £18,796, 16s., great part of which Guy expended in his lifetime, and he bequeathed £219,499 to endow it. Soon after his death an act of parliament was obtained, regulating the management of the institution. In 1829 Mr Hunt bequeathed to the hospital £190,000, and additional bequests to the amount of £10,000 have since been received. There was at first room for about 400 patients; now 700 can be accommodated. The yearly average of patients is over 5000; the out-patients relieved may amount to above 80,000. The annual income is about £40,000, chiefly from estates in the counties of Essex, Hereford, and Lincoln. The usual number of governors is sixty, who are self-elective. Students enter the hospital for study, attending clinical practice, lectures, &c., and paying annual fees. The building consists of two quadrangles, united by a cross structure or arcade, besides two wings extending from the front to the street—west wing built with elegance and uniformity, and whole edifice handsome and regular. A library and valuable museums are attached to the hospital. New wards, with tall towers for ventilation, were built in 1852, and a chemical laboratory in 1872. In the chapel is a fine marble statue of Guy, by Bacon, which cost £1000. Sir Astley Cooper is buried in the chapel. See the *History of Guy's Hospital* by Wilks and Bellamy (1893).

Guzerat. See Gujarat.

Guzman Blanco, Antonio, was born in Caracas in 1830, was banished for his share in political disturbances, and, after taking a prominent part in two invasions, became vice-president of Venezuela in 1863. Driven from office in 1868, he headed a revolution which restored him to power in 1870, and for many years he was virtual dictator of the country; other men were occasionally permitted to fill the position of president, but they were merely figure-heads. In 1889, however, popular discontent was aggravated by reports of corrupt contracts made in Paris; and Blanco, who was then acting as envoy to all the European powers, was practically deposed by congress, which refused to accept the resignation of his former protegé and present rival, Dr Rojas Paul. For Guzman Blanco state, see Cura (Ciudad de).

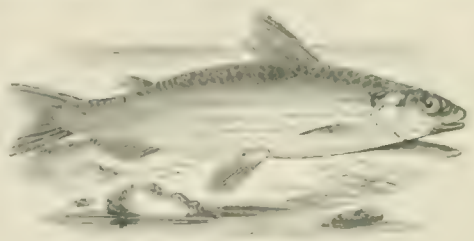
Gwalior, a native state of central India, the dominions of the Mahratta Maharajah Sindhia (q.v.), consists of several detached districts, with an area of 29,046 sq. m., lying principally between 23° 20′ and 26° 52′ N. lat., and in 76° 15′ to 79° 12′ E. long. Lying partly in the basin of the Jumna and partly in that of the Nerbudda, it divides its drainage between the Bay of Bengal and the Arabian Sea. The principal export is opium. At the census of 1881, the first attempted, the population was 3,115,857; in 1891, 3,378,774, mainly Hindus. Though Gwalior is a Mahratta principality, being, in fact, the principal fragment of the great empire of the Peshwa, yet the Mahrattas do not form any considerable proportion of the people, and are said to number only 15,000. The revenue of the state is estimated at £1,200,000; the strength of the army is fixed at 6000 cavalry, 5000 infantry, and 48 guns, and there are nearly 7500 police. Since 1803 the country has been under British protection. In 1843 the British were compelled, on the death of the sovereign, to send an armed force, which, after severe fighting, succeeded in restoring his adopted successor to the throne; and during the troubles of 1857 the young Maharajah remained faithful to the British government, although deserted by his troops.—Gwalior, the capital, stands 65 miles S. of Agra by railway. Its nucleus is an isolated rock of about 340 feet in height, perpendicular, either naturally or artificially, on all sides; it measures 1½ mile by 300 yards, and its citadel (said to date from the 8th century), whose guns sweep the only approach, is virtually impregnable against any native force. Along the eastern base of this eminence lies the old town of Gwalior, containing little worthy of notice but a beautiful mausoleum of white sandstone; and to the south-west there extends for several miles the new town called Lashkar, where the Maharajah resides. Nearly 4 miles to the north-east is Morar, the British cantonment from 1858 to 1886, when its fine sandstone barracks were handed over, along with the fortress, to Sindhia, and the European headquarters removed to Jhansi.

There are Hindu temples, a Hindu palace, Jain caves, and rock sculptures. Pop. (1891) 104,083.

Gweedore, a hamlet in a poverty-stricken district 3 miles inland from the west coast of Donegal, 28 miles NW. of Letterkenny.

Gwillim. See GUILLIM.

Gwyniad (*Coregonus clupeoides*), a small fresh-water fish, sometimes called the *Fresh-water Herring*. When full grown the gwyniad is about 10 or 12 inches in length; the first dorsal fin is high; the jaws are a little produced; the mouth is small, and the jaws are without teeth. It is found



Gwyniad (*Coregonus clupeoides*).

in some of the Lakes of Wales and Cumberland. Gwyniad is a Welsh name, while at Ullswater the fish is called *Schelly*. It occurs in that lake in great shoals, so that many hundreds are sometimes taken at a single draught of the net. It is rather an insipid fish, and cannot be kept long after being taken out of the water, unless salted, which it often is by the poor. There are numerous nearly-related species, such as the Irish 'pollan' (*C. pollan*), the 'powan' of Loch Lomond, the 'vendace' (*C. vandesius*) of Lochmaben, and the 'white fish' of North American lakes. See COREGONUS.

Gwynn, NELL. See CHARLES II.

Gyarmat-Balassa, or BALASSA-GYARMAT, a town of Hungary, 40 miles N. by E. of Pesth. Here peace was concluded between Austria and Turkey in 1626. Pop. 6788.

Gyges, king of Lydia, who obtained the throne by murdering his master, king Candaules, and marrying his widow. This happened about 687 B.C. Gyges reigned thirty-four years, during the course of which he wrested Magnesia and Colophon from the Ionian Greeks, lent assistance to Psammetichus in his revolt in Egypt against Assyria, and, after stoutly defending himself for some time against the Cimmerians, was at last slain by them (654 B.C.). Plato has a fable in which Gyges, having miraculously obtained possession of a golden ring of great virtue, was enabled by means of it to make himself invisible, and thus took occasion to murder his sovereign and usurp the supreme power.

Gymnasium. This word from *gymnos*, 'naked') was applied to those public places or buildings where the Greek youths exercised themselves, fitted up with running and wrestling grounds, baths, and rooms or halls for conversation and discussion. These were the favourite resort of youth, and for this reason were frequented by teachers, especially philosophers. The three great gymnasia of Athens were the Academy, where Plato taught; the Lyceum, where Aristotle laboured; and the Cynosarges. In this connection it is easy to understand the transference of the name to institutions for the mental disciplining and instruction of youth. The German gymnasium is an upper school where instruction is carried out largely by means of the classical tongues, preparing its pupils for the university, and corresponding roughly to the grammar and public schools of England, and the grammar and high schools of Scotland. See EDUCATION, Vol. IV. p. 208.

Gymnastics. According to the derivation and original use of the word Gymnastics (*gymnos*, 'naked or stripped') all athletic exercises might be included under this head, but the term is now much more restricted in its application. It excludes athletic sports, and all outdoor games such as cricket, football, and lawn-tennis, and is limited to certain exercises devised to strengthen the muscles and bones, especially those of the upper half of the body.

Gymnastic games in their original sense are so old as to be prehistoric; they are alluded to in the 2d and 23d books of the *Iliad*. Before the time of Hippocrates gymnastic exercises had been adopted in Greece as part of the course of medicine intended to counteract increasing luxury and indolence. The various exercises were speedily combined into a system, and gymnasia, where they should be practised, were formed first by the Lacedæmonians, and subsequently at Athens. The Romans adopted the system, and constructed gymnasia on a magnificent scale. Many of their buildings, having extensive baths attached, were known as *thermæ*. The exercises in the gymnasia consisted of running, leaping, dancing, wrestling, boxing, hurling, &c.; and in those days, when all men bore arms, and when, in close combat, victory went generally to the strongest man, these games were doubtless of great value. In subsequent ages of knightly prowess similar exercises were probably practised, though less publicly; but with the introduction of gunpowder, and through its means, the gradual substitution of fighting at a distance—in which science and skill were the main requisites—for personal encounters where strength and muscle went far to carry the day, the attention paid to gymnastics decreased, and finally vanished altogether. To make infantry soldiers perfect in the drilled movements of masses, cavalry soldiers good horsemen and fair swordsmen, and to have gunners who could take an accurate aim became the utmost sought by the possessors of great armies; while the science of gymnastics, having gone out of repute for the military, was speedily neglected in merely civil life. It is only since the earlier portion of the 19th century that the science has at all revived.

The revival commenced in Germany, where, in 1774 and 1784, gymnasia were opened by Basedow (q.v.) and Salzmann at Dessau and Schnepfenthal in Thüringen, that of the latter being under the superintendence of the celebrated gymnastic pedagogue Guts Muths (q.v.). In 1811 Friedrich Ludwig Jahn (1778–1852), the so-called 'Turnvater,' or father of gymnastics, opened the first 'turnplatz' at Berlin, and he rendered the science of gymnastics so popular that it speedily attracted the attention of the youth throughout the kingdom, and to the training thus obtained must be attributed, in no small degree, the vigour which succeeded in driving out the French army of the first empire. Sweden soon imitated Prussia, and from that time gymnastics has formed a prominent feature in the Scandinavian course of education. In Prussia the gymnasia began to be the scenes of political gatherings, too liberal in tendency to please its semi-military government; and in 1818 they were all closed. The troops were, however, continued in gymnastic exercises, and showed so clearly the advantages of the training they experienced that, about 1844, Louis-Philippe adopted and improved the system in the French army. From that time gymnasia have been constructed for almost all continental armies, and, with more or less success, for the civil population. England moved publicly in the matter in 1860, in which year Major (afterwards Major-general) Hammersley, the 'father of

military gymnastics,' was sent to Oxford to be trained in Mr MacLaren's gymnasium, and the gymnasia at Aldershot and other stations were then built and placed under his superintendence. In private life, however, there had long been many excellent gymnasia, one of the best and earliest being that opened at Oxford by the late Archibald MacLaren in 1858.

Gymnastic exercises may be divided into two great groups, those conducted without and those conducted with apparatus, while the latter group may be again subdivided into those requiring movable apparatus and those requiring immovable apparatus—i.e. so far as the gymnast is concerned.

Exercises without apparatus have been specially studied in Sweden, and there chiefly by Professor Ling (1776–1839), whose name is generally associated with them in England. By various movements of the arms, trunk, and lower limbs, singly or combined, every muscle in the body can be brought into play, and all that is required for keeping the body in health can thus easily be practised. In schools these movements have often been carried out with great advantage between lessons, giving the children that exercise which their growing frames demand, and thus avoiding restlessness, which is the natural result of enforced quiet. When a number of children work together, and especially when in time to music, the interest of the practice is greatly increased. For further information the reader may consult Dr Roth's account of the Ling system (1864), or Ling's *Swedish Gymnastics* (Lond. 1885). So important are these exercises without apparatus considered in the army that a series of them, known as 'Extension Exercises,' have been laid down in the ordinary *Field Exercise Drill-book*, and in the 1888 edition of this work they have been carefully reconsidered and improved.

Next in simplicity are gymnastic exercises with movable apparatus—i.e. such as weights and bars. Of these, the commonest forms are dumb-bells, bar-bells—i.e. bars about 3 feet long with a weight at either end—and Indian clubs. The arms and shoulders can be made to do any amount of work with these, according to the weights employed, and, if so desired, many of the exercises of the first group designed for the trunk and lower limbs may be carried out while dumb-bells or bar-bells are held in the hands, thus materially increasing the work done. The weight of any or all of these should be carefully suited to the strength of the individual, otherwise more harm than good may result from their use.

The forms of apparatus required for the last group of exercises are numerous, but only a few are really essential. Thus we have the horizontal bar, capable of being placed at any desired level between 3 and 10 feet; and parallel bars—i.e. two bars about 30 inches apart, and fixed about 4 feet from the ground. With these almost as much exercise as may be wanted can be obtained. But in most gymnasia there are, besides, iron rings hung by ropes from the roof, a trapeze-bar also hung from the roof, ladders horizontal at some distance above the floor and vertical, climbing poles and ropes, and various pulleys with weights attached for exercising the wrists and shoulders.

It is advisable that beginners working in a gymnasium should be under the direction of an instructor, who will be able to graduate their exercises, so as to avoid any overstraining. Light and loose flannel clothing should in all cases be worn.

The special value of gymnastics lies in their exercising the arms, shoulders, and chest. On this account they are particularly valuable for all who lead sedentary lives, and also as an important auxiliary for those who wish by athletic exercises to perfect their muscular development.

The system of gymnastics adopted in the British army is a thorough one, and is well calculated to develop the frames of recruits, as well as to harden and strengthen those of the drilled men. The course begins with the use of movable apparatus, after which the trunk and lower limbs are exercised by walking, leaping, and vaulting; next the muscles of the arms and of the trunk are brought out by exercises on the trapeze and parallel bars. Then the muscles of the whole body are developed by various climbing exercises on poles, ropes, and ladders; and, lastly, the training is brought to a practical bearing by escalading practice. In order to improve respiration running drill has also been instituted.

The theory of the advantage derivable from gymnastics is simple enough. An admirable law of nature provides that—within certain limits—parts of the human frame increase in strength, aptitude, and size in proportion to the use made of them. In gymnastics this law is brought to bear successively on every part, and finally on the whole system in combined action. If the exertion be not carried so far as to induce excessive fatigue, all other parts of the body sympathise with the improving condition of that which is mainly exerted; the circulation, excited from time to time by the exercise, acquires fresh vigour, and, blood being driven with unwonted force into all parts of the system, every function is carried on with increased activity. An improvement in the general health soon becomes manifest, and the mind—if simultaneously cultivated with judgment—increases in power and endurance.

See Captain Chiasso's *Gymnastics and Calisthenics*; G. Roland's *Gymnastics*; Walker's *British Manly Exercises*; and MacLaren's *Training, its Theory and Practice*, and *Physical Education, Theoretical and Practical* (1868). The books written in German on Gymnastics ('Turnkunst') would form a small library.

Gymnema. See COW-PLANT.

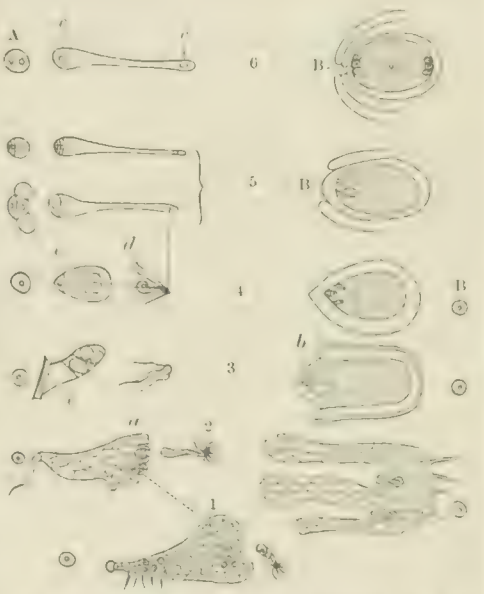
Gymnocladus, a genus of trees of the natural order Leguminosæ, sub-order Cæsalpiniæ. *G. Canadensis* is a North American tree, found both in Canada and over a great part of the United States, attaining a height of 50 to 60 feet, with branches remarkable for their upright direction, and an exceedingly rough bark which comes off in slips. The leaves of young trees are very large, three feet long, bipinnate, armed with thorns. The flowers are white in short spikes. The pods are five inches long by two broad. The tree is called *Chicot* in Canada, and sometimes *Stump Tree*, from its dead appearance in winter, and the absence of conspicuous buds. It is also called the *Kentucky Coffee Tree*, because the seeds were formerly roasted and ground as coffee in Kentucky. It grows well in Britain. The wood is used both by cabinet-makers and by carpenters. It has very little sap-wood. The pods, preserved like those of the tamarind, are said to be wholesome and slightly aperient.

Gymnogens, Lindley's term, now obsolete, for the Gymnosperms (q.v.).

Gymnosomata. See PTEROPOD.

Gymnosophists (i.e. 'naked sages'), the name given by the Greeks to those ancient Hindu philosophers who lived solitarily, wore little or no clothing, and addicted themselves to mystical contemplation and the practice of the most rigorous asceticism. Some, like Kalanus, even burned themselves to death in order to enter a state of purer being. Strabo divides them into Brahmans and Samans, the former of whom adhered to the strictest principles of *caste*, while the latter admitted any one into their number regarding whose character and kindred they were satisfied.

Gymnosperms (Gr. *gumnos*, 'naked;' hence the name Gymnosperms, 'naked seeded' plants), the lower or more primitive group of seed plants (Phanerogams, q.v.), differ in many points from the higher group, the Angiosperms. The chief differences are summarised in the article Angiosperms (q.v.). Gymnosperms consist of the orders Cycadaceæ (q.v.), Coniferæ (q.v.), and Gnetaceæ (see SEA-GRAPE). Although these orders do not resemble one another externally, their morphological characters and mode of sexual reproduction are very similar. In *structure* their stems resemble those of Dicotyledons (q.v.); the secondary wood is formed in concentric rings from permanent cambium, contains tracheides with bordered pits, but no true vessels; and secretory passages are present in most stems, containing resin in conifers and gum in cycads. It is, however, from their mode of sexual reproduction that we are able most clearly to assign their place among plants, as a connecting link between the higher cryptogams and angiosperms.



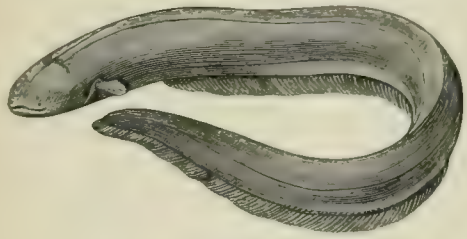
1, The fern-sporophyte (fern-Prothallus contrasted with male (or male [illegible]) Prothalli of Equisetum; 2 shows the corresponding relations of the sexual prothalli in 3, Salvinia; 4, Isoëtes; 5, Cycas; and Conifer; and 6, many Angiosperms. A, fertile segment of sporophyte; *c*, male pronucleus; *d*, spermatozoid; *e*, male prothallus. B, male spores.

In gymnosperms we first meet with an organ which is morphologically, and at the same time physiologically, a Flower (q.v.). The *flowers* are unisexual; and the plants either monœcious or diœcious; while hermaphroditism prevails among Angiosperms. The male flowers are *stamens* bearing *pollen-sacs*, which develop free unicellular *pollen-grains;* those three sets of structures being respectively the homologues of sporophylls, microsporangia, and microspores of cryptogams. Each pollen-grain divides into a large reproductive cell and one or more vegetative cells (the male prothallus of higher cryptogams). Each cell has a nucleus, and that of the reproductive cell, the *male pronucleus*, is the homologue of the spermatozoid of cryptogams. When the stamens are matured, the sacs open; the grains are shaken out, and some are borne by the wind to the surfaces of ripe ovules (macrosporangia of cryptogams). When a pollen-grain reaches an ovule it begins to germinate, its coat ruptures, the reproductive cell grows at the expense of the vegetative to form a *pollen-tube* (antheridium of cryptogams) which ultimately penetrates the nucellus of the ovule, and its pronucleus fertilises the pronucleus of the oosphere (see FERN). This is a step in advance of the higher cryptogams, for their microspores are shed from the parent plant, and germinate only in a substratum where they develop into prothalli-bearing antheridia from which spermatozoids are eventually set free. The microspores of *Salvinia natans*, a heterosporous fern, form the only exception, because they develop prothalli and antheridia within the sporangium. Spermatozoids can fertilise only with the help of water; while pollen-grains of gymnosperms are carried by the wind to the female flowers.

In gymnosperms, then, we have a very marked transition in the process of fertilisation. Spermatozoids readily pass down the neck canals of archegonia and so reach the oosphere, but they would be unable to pierce the nucellus of gymnosperms; hence the necessity of a slow-growing pollen-tube in the latter. The female flower is a macrosporangium borne at the end of an axis or shoot, or a carpellary leaf (sporophyll), with a macrosporangium in its axil, on its upper surface, or on its margin. The ovule has never more than one coat; while in many angiosperms there are two. Further, the carpellary leaves never unite to form an ovary round the ovule, which, therefore, remains naked (hence the name); in angiosperms the ovules are always enclosed in ovaries. The ovule is filled at first with a mass of tissue, the *nucellus*, in which is afterwards developed the *embryo-sac* or mother-cell (macrospore of cryptogams); this sac forms within itself a prothallus (also called endosperm of phanerogams) which develops at its anterior end several archegonia (see FERN, fig. 2). The endosperm of gymnosperms is formed before, that of angiosperms after fertilisation. Inside each archegonium is an oosphere which, after fertilisation of its pronucleus by the male pronucleus, develops the embryo. Part only of the oosphere forms the embryo, the rest forms a kind of nutritive yolk, thus resembling the eggs of many animals. This is the only example of meroblastic segmentation of the ovum in the vegetable kingdom (see EMBRYOLOGY). The embryo lies straight in the prothallus, and never curved as in many angiosperms. Concealment of alternation of generations thus takes place for the first time in gymnosperms. In vascular cryptogams there are two distinct sets of individuals—viz. the asexual (sporophyte generation) represented by the fern-plant, and the sexual (oophyte generation) represented by the minute fern-prothallus. The sexual individuals of cryptogams, with the exception of the microspores of Salvinia, lead independent lives for a time; but those of phanerogams are parasitic on the parent plant; and as parasitism leads to degeneration of parts, so we have the prothalli in gymnosperms reduced, and still more reduced in angiosperms. The evolution of plant-forms has thus been a progressive increase of the sporophyte generation at the expense of the oophyte, and this is in harmony with the characteristically anabolic nature of plants. See Goebel's *Morphology of Plants*, Sach's *Physiology of Plants*, and Vines's *Physiology of Plants*.

Gymnotus, or ELECTRIC EEL (*G. electricus*), the most powerful of the electric fishes, occurs in the fresh water of Brazil and Guiana. It is type of a family Gymnotidæ among the Physostomatous bony fishes, but is the only known species of its genus. There are no dorsal nor strictly caudal fins, but the anal fin extends on to the end of the tail; there are no scales, and the eyes are very small. The fish attains a length of 6

feet, and is capable with its shock of temporarily paralysing a man or large animal, or of killing its



Electric Eel (*Gymnotus electricus*).

prey of fishes and amphibians. For description of the electric organs, see ELECTRIC FISHES.

Gympie, a town of Queensland, 61 miles by rail S. of Maryborough. The gold-reefs round yielded in 1867–94 a total of about 1,800,000 oz. Pop. 8449,

Gynæcology, that branch of Medicine which treats of the diseases of women.

Gynocardia, the chaulmugra tree, whose seeds yield an oil highly valued in India and China as a remedy in leprosy and skin diseases.

Gyöngyös, a town of Hungary, at the southern base of the Matra Mountains, 59 miles by rail NE. of Pesth. It has mineral baths. Pop. 15,896.

Gyp, the pseudonym under which the Countess Gabrielle de Martel de Janville born Riqueti de Mirabeau, and the last of that famous stock—has written a long series of unconventional and anti-conventional novels, including *Petit Bob* (1882), *Autour du Mariage* (1893), *Elles et Lui* (1885), *Ohe! les Psychologues* (1892), *Mdlle. Eve* (dramatised in 1895), *Pas Jaloux* (1895), *Lewis Ames, Les Bons Normands!* &c. *Chiffon's Marriage* (1894: translated 1895) was greeted as her masterpiece.

Gypaëtos. See LÄMMERGEIER.

Gypsies, a wandering race, dispersed the wide world over, and distinguished by language, physique, and mode of life. Their number in Europe is vaguely estimated at 700,000; and only for the following countries have we these more or less trustworthy statistics: Hungary (1890) 95,157; Bosnia and Herzegovina (1874), 9537; Servia (1890), 37,581; Roumania (1895) 200,000; Bulgaria and Eastern Roumelia (1893), 51,754; the vilayet of Adrianople (1876), 27,326 males; Russia (1877), 11,654; Prussia (1887), 1054 *settled* Gypsies. Asia has untold thousands of these nomads, in Anatolia, Syria, Armenia, Persia, Turkestan, and Siberia; so, too, has Africa, in Egypt, Algeria, Dar-Fûr, and Kordofan. We find them in both North and South America, from Pictou in Canada to Rio in Brazil; nor are even New Zealand and Australia without their isolated bands.

Late in 1417 four hundred 'Secani' arrived from the East at Lüneburg, and thence passed on to Hamburg, Lübeck, Wismar, Rostock, Stralsund, and Greifswald. In 1418 they are heard of at Leipzig and Frankfort-on-the-Main, in Switzerland, and at Augsburg; in 1419 at Mâcon and at Sisteron in Provence; in 1420 at Deventer: in 1421 at Tournai; in 1422, *en route* for Rome, at Bologna and at Forli, where 'some said they were from India;' in 1427 at Paris; and so on till in 1433 we lose sight of them for a while in Bavaria. Oftenest they seem to have bivouacked in the fields, but at Deventer they slept in a barn, at Bologna 'lodged themselves inside and outside the gate of Galiera, and settled themselves under the porticoes, with the exception of Duke Andrew, who lay at the King's Inn.' Some riding and some afoot, with the women and children in wagons, they were led by him or Duke Michael, or by both together, according as the band, 400 to 1400 strong, split up or reunited. These two chieftains and certain subordinate 'counts' went richly dressed, with fine silver belts, and, like nobles, led dogs of chase; but the rest of the 'Egyptians,' 'Saracens,' or 'baptised heathens' are described as lean, hideous, black as Tartars, poor, and pitiful. They lived on charity, and practised horse-chaunting, purse-cutting, palmistry, shop-lifting, and ringing the changes, wherefore some were taken and slain. They bore letters of protection from the Emperor Sigismund (procured probably in 1417 at Lindau on Lake Constance), and, after 1422, from Pope Martin V.; and they professed sometimes to be engaged in a seven years' pilgrimage, imposed by their bishops as a penance for apostasy from the Christian faith, sometimes to have been driven out of 'Little Egypt' by the Saracens for refusing to apostatise. Yet another story was told by the *tented* 'Cingari or Cigäwnär,' who appeared at Ratisbon in 1424–26, that their exile was meant 'for a sign or memorial of the flight of our Lord into Egypt.' These, whose woiwode Ladislaus also bore letters (1423) from Sigismund, were natives of Hungary; the others came seemingly from the Balkan peninsula, pioneers of vast hordes behind, who in 1438 began to pour over Germany, Italy, and France, by thousands instead of hundreds, and headed this time by King Zindl. Spain they reached in 1447, Poland and Russia about 1501, Sweden by 1512, England by 1514, and Scotland by 1505, or very possibly fifty-six years earlier, for an act of 1449 refers to 'overliers and masterful beggars' as going about the country with 'horses, hunds, and other goods.'

For western Europe, then, the year 1417 does mark an era in Gypsy history; but how long before that date there had been Gypsies in south-eastern Europe remains a mystery. We recognise them dimly in Crete in 1322 as dwellers in 'little, oblong, black, low tents, like those of the Arabs,' and in caves; at Constantinople about 1050 as 'descendants of the race of Simon Magus, *Atsinkan* by name, sorcerers and famous rogues;' and there, too, in 810 as *Athinganoi*, magicians, soothsayers, and serpent-charmers. Beyond any shadow of doubt, we find them prior to 1346 on Corfu; about 1378 at Nauplion, in the Peloponnesus, receiving a renewal of former privileges; and prior to 1370 in Wallachia, whose woiwode then granted forty tents of *Atsiganï* to the monastery of Voditza i.e. the Roumanian Gypsies were already serfs, and serfs they continued till 1856. Then, in a free metrical paraphrase of Genesis, made in German about or before the year 1122 by an Austrian monk, and cited by Freytag in *Bilder aus der deutschen Vergangenheit* (ii. 226, 1859), the following passage occurs: 'So she (Hagar) had this child, they named him Ishmael. From him are descended the Ishmaelitish folk. They journey far through the world. We call them *chaltsmide* ('workers in cold metal'). Out upon their life and their manners! For whatever they have to sell is never without a defect; whenever he (*sic*) buys anything, good or bad, he always wants something in; he never abates on what he sells himself. They have neither house nor country; every place is the same to them. They roam about the land, and abuse the people by their knaveries. It is thus they deceive folk, robbing no one openly.' That Gypsies were meant here, likely as it seems at first sight, is rendered doubly likely by the fact that the names *Agarenes* and *Agarene* are expressly applied to Gypsies by Lusignan and Fritschius in 1580 and 1664, and that in German and Danish thieves' slang *Gischmedim* and *Smadem* (Ish-

machites are terms for Gypsies at the present date. Finally, the *komodromoi* ('village-roamers') of Greek writers were probably Gypsies. The term is a vague one, but no vaguer than *landloper*, which does in Dutch stand for 'Gypsy. And the *kamarinarioi*, we find, were both copper and gold smiths, roaming about the country, and using bellows made of skins, like those of Hur's Naupliote Gypsies in 1497. The verb *kamadrevein* occurs in Pollux, who flourished about 183 A.D.; and Theophanes Isaurus (758–818 A.D.) speaks under the date 514 A.D. of a *kamadrenos* from Italy. A *kamadromes* figures, moreover, in a Greek apocryphal gospel of unascertained date as helping to crucify Christ, which at once recalls the current Montenegrin legend that the founder of the Gypsy race was accursed for having forged the nails for the crucifixion.* Thus, on the one hand, it is certain that in Wallachia the Gypsies were already reduced to bondage in 1370; it is almost certain that Gypsies were nothing new in Austria in 1122; and it is at least highly probable that more than a thousand years ago there were Gypsies roaming through the Byzantine empire. On the other hand, of the Gypsies' passage of the Bosphorus, and their first arrival in Europe, no record has yet been discovered.

From numbers of scattered notices we may safely infer that the Gypsies in early times possessed every art that they possess to-day, with many besides since lost. Thus, in Scotland in 1530 they 'dansit before the king in Holyrudhouse;' between 1559 and 1628 they yearly 'acted severall plays' at Roslin, where Sir William St Clair, Lord Chief-justice, 'allowed them two towers for their residence, the one called Robin Hood, the other Little John;' in 1726 they cast the church bell at Edzell, in Forfarshire; about 1740 in the Border country they practised engraving on pewter, lead, and copper, as well as rude drawing and painting; and during that century they were famous as fiddlers and pipers, and they worked the small iron-foundry of Little Carron, near St Andrews. In England, again, in 1549 they were capable of counterfeiting the great seal; in Hungary they made bullets and cannon-balls in 1496 and 1565; and there, too, we find them celebrated as musicians as early as the 15th century. A gifted and insinuating race, equal—nay, often superior—to the nations whose lands they roamed, the early Gypsies met with a good reception, as from kaiser and pope on the Continent, so in England from the Earl of Surrey, who about 1519 entertained 'Gypsions' at Tendring Hall, Suffolk; in Scotland from James IV., who in 1505 gave Anthonius Gaginus, 'Earl of Little Egypt,' a letter of commendation to the king of Denmark. In Scotland, too, in 1540, James V. recognised the right of 'oure louit Johnne Faw, lord and erle of Litill Egipt,' to execute justice upon his company and folk, conform to the laws of Egypt. Indeed, it were easy to multiply proofs that Gypsies at a much later date have been held in consideration and regarded with interest. Charles Bosvile, a Gypsy 'king,' who was buried in 1709 at Rossington, Yorkshire, had £200 a year, and 'was a mad spark, mighty fine and brisk, keeping company with a great many gentlemen, knights, and esquires;' 'Queen' Margaret was visited at Norwood in 1750 by the Prince and Princess of Wales, and Lazarus Petulengro at the Liverpool Exhibition of 1886 by Prince Victor of Hohenlohe; whilst the Archduke Josef of Austro-Hungary is a prince among Romany Ryes (or 'Gypsy gentlemen'), as Gypsies designate lovers of their race. Still, liking and pity changed sooner or later to enmity and distrust. For the knaveries of the first immigrants were copied by their successors, and to actual malpractices, charges, more or less baseless, were added—they were kidnappers, cannibals, emissaries of the Turks. The last charge is as old as 1424, the second as 1547, and the first as 1629. Gypsies *were* used as spies by Wallenstein and Frederick the Great, but of cannibalism and child-stealing there is no just ground to suspect them, though for cannibalism forty-five Hungarian Gypsies were racked, beheaded, quartered, or hanged in 1782, for child-stealing forty-seven German Gypsies imprisoned in 1872. The charge in each case proved false. Truly, any wrong-doings of the Gypsies fade into insignificance by the side of the wrongs that were done them. In Germany so lately as the first half of the 18th century, they were hunted down like wild beasts; in one Rhenish principality, says Freytag, the record of a day's 'bag' includes, among other game, 'a Gypsy woman with her sucking-child.' England and Scotland were comparatively merciful, yet at Durham in 1592 'Simson, Arington, Fetherstone, Fenwicke, and Lanckaster were hanged for being Egyptians;' at Banff in 1701 three young Egyptian rogues were sentenced to have 'their ears cropt, be publicklie scourged through the toune, burnt upon the cheek by the executioner, and banished the shyre for ever under the paine of death.' Such are two samples of the cases whose records have come down to us, few probably in proportion to the cases whose records are lost; anyhow, these show that in England and Scotland fully four-score men and women were hanged or drowned between 1577 and 1701 for the offence of being what Nature had made them. The penal laws passed against the race between 1530 and 1596 were repealed in 1784; but even in 1819 it was carried unanimously at the Norfolk Quarter Sessions 'that all persons wandering in the habit or form of Egyptians are punishable by imprisonment and whipping.' One important factor in the geographical distribution of the Gypsies has been deportation—from England to France and Norway (1544); from Scotland to Barbadoes and the American plantations (1665, 1699, 1715, &c.); from Portugal to Africa till 1685, and thereafter to Brazil; from Spain to Louisiana (some time prior to 1800); and from the Basque country *en masse* to Africa (1802).

At Tobolsk in 1721 Bell of Antermony heard of sixty Tsigans, journeying from Poland to China; in 1851 a hundred Hungarian Gypsies passed through Frankfort *en route* for Algeria; since 1866 large bands of *Calderari*, or Gypsy smiths from south-eastern Europe, have made the round of the Continent, visiting Norway, England, even Corsica; in 1879 fez-wearing Gypsies were camping in Sweden; and in 1886 ninety-nine 'Greek' Gypsies were stopped at Liverpool on their way from Corfu to the United States. Thus the nomad instinct survives, and with it a marvellous faculty for picking up foreign languages—a Hungarian Gypsy will speak even Basque like a native. British Gypsies, however, hardly ever visit the Continent; and almost everywhere there are sedentary as well as nomadic Gypsies, though in what proportion it were hard to guess. Sometimes they go into houses only for the winter, but some-

* [illegible] Gypsy, when the three nails would be an easily intelligible pro[illegible]

times the house or cave (not tent or caravan) is their permanent abode. Nay, it is curious that, though there certainly were Gypsy tent-dwellers in Wallachia in 1370, at Ratisbon in 1424, as there are to-day in Persia and America and in all intermediate lands, still, as a rule, the early chroniclers are silent as to Gypsy tents; and the word for 'tent' differs in almost every Rómani dialect, indeed is oftenest a borrowed term.

There are few trades that Gypsies have not somewhere or at some time turned their hands to. In England the writer has known them to follow the callings of clergyman, billiard-marker, Salvationist, betting-man, quack-doctor, chimney-sweep, gun-maker, pugilist, actor, carpenter, cabman, &c., as well as of hawker, knife-grinder, showman, and the like. But everywhere the men follow the three specifically Gypsy callings of horse-dealers (slave-dealers in Brazil, too, formerly), musicians, and workers in metal; everywhere the women are adepts at fortune-telling. Their musical talent has rendered them famous as harpists in Wales, as singers in Moscow, as violinists in Hungary; and from Hungary since 1878 their fame has extended to Paris, London, Liverpool, Edinburgh. There are no such players of the *czardas;* still Liszt's theory that Hungary owes its national music to the Gypsies has been impugned by competent authorities. What then of the paradoxical claim, put forward by M. Bataillard, that Europe —at anyrate northern and western Europe—is indebted to prehistoric Gypsies for its knowledge of metallurgy—i.e. for everything that makes life livable? If we examine this claim, the paradox sensibly diminishes. On the one hand, Sir John Lubbock, without a thought of the Gypsies, had in 1865 been led to the independent conclusion that the art of making bronze was introduced into Europe from the East by a small-handed race like the Egyptians or the Hindus, a nomad race too, who practised the self-same methods in different lands, and who, whether acquainted or not with iron, were exclusively workers in bronze. What race this was he leaves an unsolved problem, except that it certainly was not the Phœnicians. On the other hand, the Gypsies of south-eastern Europe and Asia Minor enjoy a practical monopoly of metal-working. So exclusively is the smith's a Gypsy (and therefore a degrading) craft in Montenegro that, when in 1872 the government established an arsenal, no natives could be got to fill its well-paid posts. In 1880 Mr Hyde Clarke wrote in a letter that 'over more than one sanják of the Aidin viceroyalty the Gypsies have still a monopoly of ironworking, the *naalband*, or shoeing-smith, being no smith in our sense at all. He is supplied with shoes of various sizes by the Gypsies, and only hammers them on.' In 1856 Mr Gardner, consul at Jassy in Moldavia, described the Gypsies as 'the blacksmiths and locksmiths of the country;' in Transylvania, says Boner (1865), 'Gypsies are the best farriers, and as blacksmiths generally they excel. All the ironwork of a village is done by them.' Add to this, and much more of the sort might be quoted, the fact that very many of the early notices of Gypsies, some of which we have cited, refer to their skill in metallurgy. Next, put two and two together, though many important links in the chain of reasoning are necessarily omitted here for want of space. Suppose that there were prehistoric Gypsies in Europe (and history knows nought of their arrival), that they were nomad smiths, like the *kómodromoi* of the 7th century A.D., the 'Ishmaelites' of the 12th century, and the Hungarian *Calderari* who visited Norway in 1874; that they were workers in bronze, to the exclusion of iron, like the Gypsy 'Zlotars' to-day in eastern Gallicia (bell-founders these, like the Scottish tinklers of 1726, and goldsmiths, too, like the *kómodromoi*)—supposing all this, we say, then have we not possibly identified the unknown race, small-handed like the Gypsies, and, like the Gypsies immigrants from the East? An objection, raised by the writer in 1878 to Bataillard's theory, is that in every Gypsy dialect of Europe nearly all the metallurgical terms seem to be directly borrowed from the Greek: *pétalo*, 'horseshoe' (*pétalon*); *kalai*, 'tin' (*kalaion*); *kharkoma*, 'copper' (*chalkoma*); *kakkavi*, 'kettle' (*kakkabí*); *mulav*, 'lead' (*mólybdos*); *rin*, 'file' (*rinē*); and half a dozen more. This looked like an insuperable objection; for how, unless the Gypsies had adopted the farrier's craft since their arrival in a Greek-speaking country, should their word for 'a horse' be Indian, for 'a horseshoe' Greek? But, Bataillard contends, the converse may be the case, the Greeks may have borrowed their terms from Rómani. Certainly, the occurrence of *pedol* in Welsh (12th century, *pedhaul*), for 'horseshoe,' looks like more than a mere coincidence; and *gh'ala*, the word for 'tin' with Asiatic Gypsies, seems to forbid our deriving *kalái* from *kalaion*. Anyhow, Bataillard's theory is gaining favour with foreign archæologists, among whom MM. Mortillet, Chantre, and Burnouf had arrived *independently* at similar conclusions.

The counter-theories as to the origin of the Gypsies need not detain us long. There is the Tamerlane theory of Grellmann (1783), according to which the Gypsies first reached Europe in 1417 —a theory disproved by firmly-established facts. There is the Behram Gur theory of Pott and Bataillard (who since relinquished it), developed in 1844–49, and adopted by Newbold, Sir Henry Rawlinson, De Goeje, Sir Richard Burton, and an *Edinburgh* Reviewer (July 1878). According to this theory, about 420 A.D., Behram Gur imported 12,000 Jat minstrels from India to Persia, and their descendants, gradually wandering westward, entered Europe in 1025 or as late as the beginning of the 14th century. Plausible, and it may be containing a modicum of truth, this theory fails as a whole in view of the marked unlikeness of Játaki, the language of the Jats, and Rómani, the language of the Gypsies. Lastly, attempts have been made, on the ground for the most part of a similar habit of life, to identify the Gypsies with various Indian vagrants—e.g. by Richardson with the Nāts (1803), by R. Mitra with the Bediyás (1870), and by Leland and Grierson with the Doms (1873–88). Even if successful, such identification would prove little more than that India, like Egypt, has its Gypsy tribes—a fact in itself extremely probable, but so far lacking linguistic corroboration.

Language.—What their religion has been to the Jews, that their language is to the Gypsies—a bond of universal brotherhood. For Gypsies everywhere speak the self-same *Romani chiv* ('Gypsy tongue'). Their words for 'water' and 'knife' are in Persia *páni, cheri* (1823); in Siberia, *panji, tschuri* (1878); in Armenia, *pani, churi* (1864); in Egypt, *páni, chúri* (1856); in Norway, *pani, tjuri* (1858); in England, *pani, churi* (1830); in Brazil, *panin, churin* (1886)—where spelling and dates are those of the works whence these words have been taken. But over and above their identity—and there are hundreds more like them in every Gypsy dialect—they are identical with the Hindustani *pani* and *churi*, familiar to all Anglo-Indians. To cite but a few more instances, 'nose,' 'hair,' 'eye,' 'ear' are in Turkish Rómani *nal, bal, yak, kann*; in Hindustani, *nak, bal, akh, kan*; whilst 'Go, see who knocks at the door' in the one language is *Já, dik kon chalarela o cudar*, and in the other *Ja, dekh kon chalaya dear ko*. This discovery was not made

till long after specimens of the Gypsy language had begun to be published by Andrew Boorde (q.v.) in 1547, whose twenty-six words, taken down seemingly in an English alehouse, were intended to illustrate the language of Egypt; by Bonaventura Vulcanius (1597), whose vocabulary of seventy-one words, collected probably in Belgium, fills up some blank pages in a work on the Goths; and by Ludolphus (1691), whose thirty-eight words are embedded in a history of Ethiopia. First in 1782 Rudiger in Germany, followed next year by Grellmann, and in England (independently) by Marsden, observed the resemblance of Romani to Hindustani; and Grellmann straightway leaped to the conclusion that the Gypsies who showed themselves in western Europe in 1417 had newly come also to south-eastern Europe, and were a low-caste Indian tribe expelled from their native country about 1409 by Tamerlane. In 1783 the older languages of India were a sealed book to Europeans, and Grellmann's opinion found almost unanimous approval for upwards of sixty years; but thanks to the linguistic labours of Pott, Ascoli, and Miklosich, combined with the historical researches of Batailland, the question has now assumed a new aspect. For while on the one hand it has been proved that Europe had its Gypsies long before 1417, so on the other Romani has been shown to be a sister, not a daughter—and it may be an elder sister—of the seven principal New Indian dialects. Not a few of its forms are more primitive than theirs, or even than those of Pali and the Prakrits—e.g. the Turkish Rómani *vast*, 'hand' (Sansk. *hasta*; Pali, *hattha*), and *vusht*, 'lip' (Sansk. *ostha*; Pali, *ottha*). Miklosich, however, has pointed out that many of these seemingly archaic forms in Rómani may be matched from the less-known dialects of India, especially north-west India—that we find, for example, in Dardu both *hust* and *usht*.

In the Rómani vocabulary (five thousand words rich perhaps), besides the Indian elements that constitute its basis, there is also a largish percentage of borrowed words—Persian, Armenian, Slavonic, Roumanian, Magyar, &c. Thus, the English dialect has *ambrol*, 'pear' (Pers. *amrud*); *grasnu*, 'mare' (Arm. *yrast*, 'beast of burden'); *paramasin*, 'scandal' (Mod. Gr. *paramútha*, 'story'); *kalecas*, 'stockings' (Slav. *chulcra*); *cari*, 'any' (Roum. *vare*); and *stiffi-pen*, 'sister-in-law' (Ger. *stief-*). These words and the like are a record of the route by which the English Gypsies arrived in England; and as the fifty Greek and the thirty Slavonic words outnumber all the other borrowed words put together, it follows that the Gypsies tarried longest in Greek- and Slavonic-speaking lands. Again, *drom*, *dromi*, or *drom* (Gr. *dromos*) is the Rómani word for 'road' not only in England, but in Turkey, Roumania, Hungary, Bohemia, Poland, Lithuania, Russia, Scandinavia, Germany, Italy, Spain, and Brazil; and the like holds more or less good of the Gypsy words for 'Sunday,' 'chair,' 'hat,' 'anger,' 'bone,' 'soup,' 'pawn,' &c. from the Greek; for 'pease,' 'beer,' 'inn,' 'cat,' 'cloak,' &c. from the Slavonic. This is important as indicating that the modern Gypsies are descended not from successive waves of Oriental immigration, but all from the self-same European-Gypsy stock, whenever that stock may have first been transplanted to Europe. It conclusively negatives a theory like Kounavine's, that the Italian, Spanish, Basque, and French Gypsies arrived at their present habitats by way of Africa, and the Scandinavian Gypsies by way of the Ural Mountains. Still more important is the question of the presence or the absence of Arabic words in European Rómani. According to De Goeje (1875) there are ten such words; according to Miklosich (1878)—and rightly as it seems—there are none. Neither, however, of the two scholars has perceived the possible importance of the presence or the absence (especially the absence) of Arabic elements. Rómani undoubtedly contains Persian words; would it not have certainly contained also Arabic words if the ancestors of our modern European Gypsies had sojourned in Persia, or even passed through Persia, at a date later than the Arab conquest of Persia? If Miklosich is right in his contention that there are no Arabic words in European Rómani, it follows almost inevitably that the Gypsies must have passed through Persia on their way to Europe at some date prior to the middle of the 7th century A.D. In this connection it should be pointed out that the dialect of the Gypsies of Asia Minor differs far more, alike in grammar and in vocabulary, from that of the Gypsies of Turkey than does the latter from that of their brethren in Wales.

The Gypsies of Montenegro are said to have completely lost their language; elsewhere Rómani has suffered more in grammar than in vocabulary. In Spain, in Brazil, in Scotland, and in Norway its genuine inflections have been wholly or almost wholly superseded by those of Spanish, Portuguese, English, and Norwegian. In England this process is still going on, affording an unquestionable instance of 'mixed grammar,' such as Max Müller has pronounced an impossibility. There is every variety of shade, from almost absolute purity to as almost absolute corruption. Thus, a Welsh Gypsy writes in a letter, *Dava ma temen borro parichyáva* for *tomorro camlo drom* ('Give I you great thanks *for* your loving way'); and an English Gypsy, *Mandy kek gin so* to *pen* ('Me not know what *to* say'), where the pure Rómani would run, *Kek me jaanva me so te penar*. No Gypsy dialects have been better preserved than those of Turkey at one end of Europe, and of Wales at the other end; from a comparison of these it is easy to see how little they can have altered since the ancestors of those who now speak them parted company five centuries ago. Thus, the twenty-one forms in Turkish Rómani of the third personal pronoun (masc., fem., and plur.), with two exceptions, reappear almost or quite unchanged in the Welsh dialect. The plural, for instance, runs in Turkish Rómani, *ol*, 'they;' *len*, 'them;' *léngoro*, 'their;' *léndhe* or *lénghe*, 'to them;' *léndja*, 'with them;' *léndar*, 'from them;' and in Welsh Rómani the corresponding forms, occurring in letters written by a self-educated Gypsy, are *yon*, *lon*, *longo*, *lendy* and *lengey*, *lensa*, and *lenda*. Four of the cases, it will be seen, are formed by suffixing postpositions to the accusative; and this, too, holds good of the nouns. Many of the verbal inflections are almost equally simple, and may be as readily analysed by means of Rómani itself. In the final syllables of *dá-va*, 'I give;' *dé-sa*, 'thou givest;' and *dé-la*, 'he gives,' we recognise the first, second, and third pronouns. From the past participle *dino* and *isóm* or *hom*, 'I am;' *isomas* or *homas*, 'I was,' are formed *diniom*, 'I gave;' and *diniómas*, 'I had given'—formations recalling those of Latin deponents. The future, formed by prefixing *kama* ('will') to the present, as *kamadáva*, 'I will give,' was modelled probably on the Modern Greek *thélo* or *tha*.

So far, our ablest Gypsiologists are divided in opinion as to the probable antiquity of Rómani. On the one hand Ascoli maintains that, 'having retained certain *nexus*, or combinations of consonants, which had almost wholly disappeared at the epoch of the oldest known Prakrit texts, this lowly idiom herein surpasses Pali itself in nobility, and more nearly approaches Sanskrit.' Miklosich, on the other hand, contends that 'from the agreement of Rómani in so many important points with the

modern Aryan languages of India, it follows that the emigration cannot have taken place till after the formation of the latter—i.e. till after the Prakrit period, in which the old system of declension was still recognised; since one is hardly inclined to assume that Rómani, severed from its most nearly-related idioms, developed itself in the selfsame manner as they.' In his *Comparative Grammar of the Modern Aryan Languages of India* (3 vols. 1872–79) Mr Beames arrives at a similar conclusion, that 'the language of the Gypsies is purely Aryan in its structure, and Modern Aryan too, being in many respects quite as far removed from the old synthetical system as any of the seven languages now under discussion.'

Names.—Alike in Turkey and England, in Finland and Italy, the Gypsy calls himself *Rom* ('man' or 'husband'), from which come *Rómni* ('female Gypsy,' 'woman' or 'wife') and the adjective *Rómano* ('Gypsy'). In Asia Minor the form is *lom*, and in Syria *doum*, which comes very near the Sanskrit *doma* and modern Indian *dom*, 'a low-caste musician. 'Husband' is clearly a secondary meaning of *Rom*, and 'man' the primary; so that one is almost tempted to connect *Rom* with the ancient Egyptian *rôme*, 'man' (Rawlinson's *Herodotus*, ii. 225), and to believe that there really is something in the alleged Egyptian origin of the Gypsies. That belief was assuredly current in south-east Europe prior to their westward migration, and is current to-day from Armenia to America, having been stereotyped in such names as the modern Greek *Gyphtoi*, the Albanian *Jevk*, the Turkish *Farâwni* and Magyar *Pharao népe* ('Pharaoh's folk'), the English *Gypsy*, and the Spanish *Gitano*. Another very widespread name is the Syrian *Jingânih*, Modern Greek *Atsinganoi*, Turkish *Tchinghiané*, Magyar *Tzigany*, German *Zigeuner*, Italian *Zingaro*, &c., perhaps identical with the Persian *zingar*, 'a saddler.' We can merely glance at the infinite variety of names applied to the Gypsies in different ages and different localities—e.g. *Heiden* ('heathen'), *Saraceni*, *Nubiani*, *Uxii*, *Cilices*, &c. by early writers, and the Persian *Karâchi* ('swarthy'), the Modern Greek *Katzibeloi*, the Cypriote *Kilindjiridès*, the French *Bohémiens*, and the Scandinavian *Tatere* ('Tartars'). Only, if under these manifold and frequently misleading names we can safely recognise Gypsies, it is at least just possible that we should also recognise them in the *Dynamitters* (traders from foreign parts who sold brazen pots at Winchester fair in 1349), in the *Bemische* ('foreigners' at Würzburg about 1388; Gypsies incontestably at Frankfort in 1495); in the tent-dwelling refugees from Hungary and Lorraine, who are said to have discovered the Stourbridge fireclay about 1555; or even in the Kenites, nomad tented tinkers and blacksmiths in ancient Palestine (*cf.* Sayce and Neubauer in the *Academy*, Nov.–Dec. 1886). In England, common Gypsy surnames are Boswell, Buckland, Cooper, Gray, Herne, Lee, Lovell, Smith (*Petulengro*), and Stanley—assumed, some at least, probably from former patrons of the race. Among their 'Christian' names are Mantis, Perun, Plato, and Pyramus; Delarîfa, Meralini, Memberênci, Perpénia, and Sinaminti.

Songs and Folk Tales. *Chin*, Rómani for 'write,' means literally 'cut,' so points back to a dim antiquity; still, the Gypsies have neither alphabet nor literature. Many Rómani songs, however, have been taken down in Spain, Hungary, Roumania, and elsewhere—ballads, love- and dance-songs, and threnodies. The last, collected in Transylvania by Wlislocki, are instinct with pathos and poetry; but the rest, rude in rhyme and in rhythm, as a rule have only a linguistic value. The famous 'Pharaoh lay' is known to us only through a very corrupt fragment. The case is otherwise with Gypsy folk-tales, of which nearly 200 have been collected since 1862 in Turkey, Roumania, Austro-Hungary, Wales, &c. A meagre store, yet sufficient to enable us to arrive at certain definite conclusions. First, in different collections we meet with variants of one and the same story—e.g. three of 'The Valiant Little Tailor,' and three of 'The Master Thief.' Secondly, many (perhaps most) of the Gypsy stories are identical with, though not seldom superior to, stories current amongst non-Gypsy races. Thirdly, there are certain episodes in Gypsy stories, and certain whole Gypsy stories, for which diligent research has failed to produce any parallel. Fourthly, a number of non-Gypsy stories present strong internal evidence of the probability of their Gypsy origin. Now, as early as 1856 the Gypsies were termed the 'rhapsodists of Moldo-Wallachia;' in Turkey Gypsies are professional story-tellers; their stories there are proved to be 'very old' by their retention of otherwise forgotten Rómani words; in the Scottish Highlands a tented tinker was one of Campbell's four principal sources; and finally, according to Benfey, Ralston, Cosquin, Clouston, and other folklorists, most of the popular stories of Europe are traceable to Indian sources (see FOLKLORE). But how? by what channels?—one channel, perhaps, was the Gypsies.

Religion.—Of the Gypsies' religion not much need be said, as they do not possess one. They probably had one at starting; but, if so, they lost it by the way. In spite of frequent statements to the contrary, Rómani has words for God, devil, soul, heaven, cross; but *trúshul*, 'cross,' originally stood for Siva's trident. So, too, their folklore enshrines many strange survivals of dead heathenry—of tree and serpent worship, of phallicism, tabu, and the vampire superstition. But everywhere Gypsies profess the faith of the land of their adoption—Mohammedan, Orthodox, Catholic, Protestant. They bring their children to baptism, and are scrupulous in the matter of Christian sepulture. At Steinbach in 1445 the 'high-born Duke Panuel' was buried beneath a scutcheoned monument; at Dayton, Ohio, in 1878, 'Queen' Margaret Stanley was borne with regal honours to the grave; and scores of similar cases could be cited in England, where at Malmesbury in 1657 'John Buccle, a gypsie, was buried in King Athelstone's chapel,' and at Steeple Barton in 1794 'Peter Buckland, a great man among the Gypsies, said to be very wealthy,' was interred in the chancel. Otherwise, unless for marriages, nor always then, the Gypsies are not great church-goers.

Character.—There are Gypsies and Gypsies. The better sort are quick-witted, courteous, likeable, trustworthy when trusted, and lavishly generous with the one hand, though the other may itch for a bargain. Untrammelled by prejudices, and vexed by no lofty ambition, they have picked up a sort of peripatetic philosophy, so lead a pleasant, cuckoo-like existence, and make the best of this life—for a next they have small concern. As to faults, these 'spoilt children of Nature' are boastful, passionate, crafty, superstitious, thriftless, and indolent; they break most of the Decalogue's precepts, but lightly—great criminals are few among them. Still, horse-dealing and palmistry have not proved ennobling vocations. Piety, which is rare with Gypsies, is apt to assume the form of cant; and learning, which is rarer, of conceit. Indeed, the best Gypsy is the Gypsy *au naturel*, the life-long tent-dweller in country lanes; and he, like all *ferœ naturæ*, is threatened with extinction. Gypsies' virtues are largely their own, an outcome of open-air life; their vices are ascribable to centuries of oppression, which have left them a singular compound of deep-seated gloom and quicksilver light-heartedness, have made them suspicious and hostile

towards all the rest of mankind. 'There's nothing worse,' says the Gypsy, 'than nasty gaujos,' than all, that is, who have not enjoyed the privilege of Gypsy birth. For of that he is genuinely proud; he is honestly grateful that *he* 'hasn't got to live in none of your poverty houses.' Gypsy celebrities, outside the realm of music, have been few. John Bunyan has been claimed as one, but on slender grounds; so have Masaniello and the painter Antonio Solario (1382–1455), nicknamed 'Lo Zingaro.' Anyhow there is Jem Mace, the champion pugilist; and Mrs Carlyle was proud of her Baillie ancestry.

Physique.—Early writers all speak of the Gypsies as hideous, but such language is like early travellers' descriptions of Alpine scenery. For the race is a comely one: its most marked characteristics the tawny olive skin, the dark lustrous eye, the dazzling teeth, the black or dark-brown hair (often frizzled and somewhat coarse), the thoughtful brow, and the lithe sinewy form, with finely-made hands and feet, and arms short in comparison to the legs. The skull is mesocephalic.

Bibliography.—There are more than 300 books, pamphlets &c. on the Gypsies, but one and all might have seemed almost valueless beside the 'immense collections' of Michael Ivanovitch Kounavine (1820–81). A Russian by birth, by profession a medical man, he lived, we are told, during 1841–76 among the Gypsies of Germany, Austria, southern France, Italy, England, Spain, Turkey, northern Africa, Asia Minor, central Asia, Hindustan, and Russia, and, with much else, collected 385 tales, traditions, and ritual songs, cushtas; a wealth of mythological and legendary lore. Unfortunately those collections have disappeared, and we know them only through an abstract formed before the collector's death by his friend, Dr A. Elysseef, member of the St Petersburg Geographical Society, and translated from Russian through French for the *Gypsy Lore Journal* (1890). Indian Gypsies have been treated by MacRitchie (1886); Persian by Sir W. Ouseley (1823) and Newbold (1850); Syrian by Pott (German, 1846), Seetzen (Ger. 1854), Newbold (1856), and Everett (1890); Anatolian by Pasparti (French, 1870) and Elysseef (1889); Armenian and Siberian by Miklosich (Ger. 1878); Egyptian by Newbold (1850), Von Kremer (Ger. 1852), and Leland (1873–82); Central African by Felkin (1889); Algerian by Batellard (Fr. 1874); Turkish by Pasparti (Fr. 1870) and Colocci (Ital. 1889); Roumanian by Kogalnitschan or Cogalnitceanu (Fr. 1837) and Vaillant (Fr. 1868); Montenegrin by Bogisic (Ger. 1874); Servian by Miklosich (Ger. 1876); Bosnian by Kopernicki (1890); Hungarian by Bright (q.v., 1818) and the Arendalske Josef Hung. 1888); Transylvanian by Wlislocki (Ger. 1880–89); Bohemian by Puchmayer (Ger. 1821) and Jecna (Ger. 1886); Slovak by Kalina (Fr. 1882) and Von Sowa (Ger. 1887–90); Polish by Danilowicz (Pol. 1824) and Czicki (Pol. 1845); Crimean by Koppen (Ger. 1874; Eng. 1890); Russian by Böhtlingk (Ger. 1853) and Miklosich (Ger. 1872–78); Lithuanian by Narbutt (Pol. 1830) and Dowojno-Sylwestrowicz (1890); Norwegian by Smidt (Norw. 1850–65); Danish by Dyrlund (Dan. 1872); German by Liebich (Ger. 1863); Dutch by Dirks (Dutch, 1850); English and Welsh by Bryant (1784), Hoyland (1816), Harriot (1830), Crabb (1831), Roberts (1836), Borrow (q.v. 1841–74), Leland (1873–82), Smart and Crofton (1863–88), and Groome (1880); Scottish by Baird (1839–62), Simson (1865), MacRitchie (1884–94); Basque by Michel (Fr. 1857), Boudrimont (Fr. 1862), and Wentworth Webster (1888); Italian by Ascoli (Ger. 1865) and Colocci (Ital. 1889); Catalonian by MacRitchie (1888); Spanish by Borrow (1841), Campuzano (Span. 1851), and Mayo (Span. 1870); Brazilian by Melo Moraes (Port. 1885–86); and North American by Simson (1865) and Leland (1882). Hereto should be added, for music, Liszt (Fr. 1859), Leland (1882), and Thewrewk de Ponor (1889); for folklore and folktales, Leland's *Gypsy Sorcery* (1891) and eight works cited by Groome in the *National Review* for July 1888; for costume, Crofton (1876); for metallurgy, Andree (1884); for craniology and physique, Kopernicki (Ger. 1872), Hovelacque (Fr. 1874), and Weisbach (Ger. 1889); for history, Grellmann (Ger. 1783, Eng. trans. by Raper, 1787, Sprengler (Lat. 1839), Hopf (Ger. 1870), Crofton (1888), and, especially, Bataillard (1844–90), and for the language as a whole, Pott (q.v., Ger. 1844–45), Ascoli (Ger. 1865), and Miklosich (q.v., 1872–80). Of these works the fullest of several bibliographies is that furnished by Colocci in *Gli Zingari* (Turin, 1889). Painters to whom the Gypsies have furnished subjects have been Caravaggio, Callot, Morland, Phillip, and Burgess; novelists, poets, playwrights, and composers Cervantes, Scott, Victor Hugo, George Meredith, Le Fanu, Theodore Watts, Matthew Arnold, George Eliot, Peschken, Kruszewski, Brachvogel, Richepin, Balfe, Verdi, Brahms, Bizet, &c. (see Grosche, *Die Zigeuner als Typus in Dichtung und Kunst*, 1879). Finally, a vast mass of material is to be found in the quarterly *Journal* (Edin., Constable) of the cosmopolitan Gypsy Lore Society, which was founded in 1888, and survived until 1892.

Gypsum is a valuable mineral of a comparatively soft nature. Chemically it is a hydrated sulphate of lime, $CaSO_4 + 2H_2O$. Its specific gravity is 2·31, and its hardness is from 1·5 to 2 of the mineral scale. The massive marble-like variety, which is usually white or delicately tinted and translucent, is called Alabaster (q.v.); when transparent and crystallised it is known as Selenite (q.v.); and when fibrous and with a pearly opalescence it is termed satin spar.

Gypsum occurs in various geological formations, and has a wide geographical distribution. Extensive beds of the common variety are generally made up of irregular, concretionary, nodular masses. In the New Red formation near Derby, at Carlisle, and in some parts of Nottinghamshire, as well as in the Tertiary beds of the suburbs of Paris, it is largely worked for the preparation of plaster of Paris. Productive beds of it are found in numerous localities in the United States, principally in Ohio and Michigan; in New Brunswick, Nova Scotia, and Ontario; and in the Punjab. Gypsum is very frequently associated with rock-salt. See ANHYDRITE.

Gypsum contains 21 per cent. of water, which can be driven off by heat. It is burned in kilns at or a little below a temperature of 250° F., and afterwards ground to a fine powder, which is called *plaster of Paris*. This recombines with water, evolves heat, and almost immediately solidifies or *sets*. It is this property which makes it so serviceable for many purposes in the industrial arts. If in the burning of gypsum the temperature is raised as high or higher than 480° F. it loses the power of rehydrating, and is then said to be *dead burnt*, in which state it will not set when mixed with water. Like gypsum, plaster of Paris is soluble to the extent of rather more than 2 parts in 1000 parts of water at ordinary temperatures, its point of maximum solubility being 95° F. It is therefore unsuited for external work, except in dry climates such as that of Persia. For making casts the plaster of Paris is made up with water to a consistency of thick cream. In this state it is poured into a mould, which is usually also made of the same material, and left to solidify. Some oil, such as olive, is brushed over the mould to form a *parting* between it and the cast. Plaster of Paris is most extensively used for taking casts of sculpture and architectural details, as well as for casts of small objects such as coins, medals, and engraved gems. For pottery moulds it is also largely employed, and it is used to take a first copy from the modelled clay in the production of metal patterns. Large quantities of it are consumed for the mouldings of the internal plasterwork of houses, and for cornice and other ornaments. For hardened plaster of Paris, such as Keene's cement, see CEMENTS; and for the agricultural applications of gypsum, see MANURES. Gypsum is one of the substances which renders

water hard, and such water is useful in the brewing of some kinds of beer. *Pearl hardening*, used as a filling in the manufacture of some kinds of paper, is an artificial sulphate of lime, precipitated by sulphuric acid from chloride of calcium. *Fictile Ivory* is plaster of Paris which has been made to absorb beeswax, spermaceti, and stearic acid, in their melted state.—The average annual production of gypsum in Great Britain is nearly 120,000 tons, value about £48,000. In 1888 the production of the United States was about 96,000 tons; of Nova Scotia, 126,118 tons. For the anhydrous sulphate of lime, see ANHYDRITE.

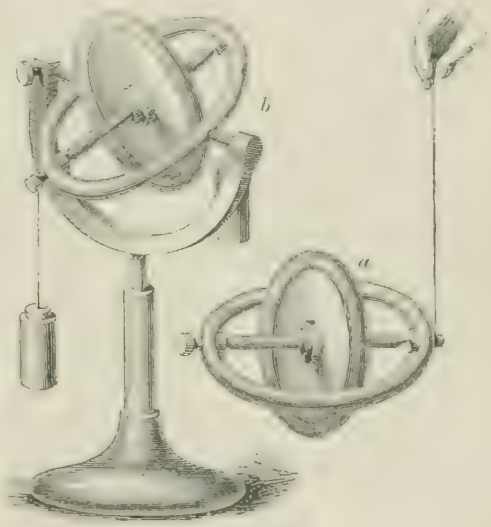
Gypsy-wort (*Lycopus europæus*), sometimes also called Water Horehound, is a perennial plant belonging to the natural order Labiatæ. It is a tall erect branching plant, slightly hairy, with a creeping root-stock. It is common in moist places in Britain, the Continent, Russian and central Asia, and North America; and is regarded as a febrifuge and astringent. It dyes black, and gives a permanent colour to wool, linen, and silk, and as long ago as 1578 the Gypsies were fabled to stain their skin with it. The Bugle-weed of North America (*L. virginicus*) has more powerfully astringent properties.

Gyrfalcon. See FALCON.

Gyroscope (Greek) is the name given to an instrument for the exhibition of various properties of rotation and the composition of rotations. It differs from a top in having both ends of its axis supported. The invention is probably French or German, and in some of its forms it dates from about the end of the 18th century.

If a mass be set in rotation about its principal axis of inertia of greatest or least moment, it will continue to revolve about it; and, unless extraneous force be applied, the direction of the axis will remain unchanged. Such, for instance, would be the case with the earth, were it not for the disturbances (see NUTATION and PRECESSION) produced by the sun and moon: the direction of the axis would remain fixed in space. It is for this very reason that modern artillery is rifled. If, then, a mass of metal, as, for instance, a circular disc, loaded at the rim, and revolving in its own plane, be made to rotate rapidly about its axis of greatest moment of inertia, and if it be freely supported (in gimbals, like the box of a compass), the direction of its axis will be the same so long as the rotation lasts. It will therefore constantly point to the same star, and may, of course, be employed to show that the apparent rotation of the stars about the earth is due to a real rotation of the earth itself in the opposite direction. This application was made by Foucault shortly after his celebrated Pendulum (q.v.) experiment, as it had been many years before (March 1836) by Dr Sang (see the *Trans. of the R. Scot. Soc. of Arts*). It is, in practice, by no means so perfect a mode of proving the earth's rotation as the Foucault pendulum; but this arises solely from unavoidable defects of workmanship and materials. Professor Piazzi Smyth has applied this property of the gyroscope to the improvement of our means of making astronomical observations at sea. A telescope, mounted on the same support as the ends of the axis of the gyroscope, will, of course, be almost unaltered in position by the rolling or pitching of a vessel; and a steady horizon, for sextant observations of altitude, may be procured by attaching a mirror to the support of the gyroscope, and setting it once for all by means of spirit-levels.

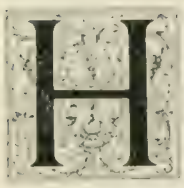
But the most singular phenomena shown by the gyroscope are those depending on the *composition* of rotations (see ROTATION). Any motion whatever of a body which has one point fixed is of the nature of a rotation about an axis passing through that point. Hence, simultaneous rotations about any two or more axes, being a motion of some kind, are equivalent to a rotation about a single axis. The effect, then, of impressing upon the frame in which the axis of the spinning gyroscope is suspended a tendency to rotate about some other axis, is to give the whole instrument a rotation about an intermediate axis; and this will coincide more nearly with that of the gyroscope itself, as the rate of its rotation is greater. The compound motion consists in the rolling of an imaginary cone fixed in the gyroscope upon another fixed in space; the rotation of the axis of a top round the vertical (when it is not 'sleeping' in an upright position), and the precession of the earth's axis, are precisely similar phenomena. Thus, when the gyroscope is spinning, its axis being horizontal, a weight attached to the framework at one end of the axis (fig. *b*) makes the whole rotate about the vertical; attached to the other end, the rotation takes place in the opposite direction. And the framework may be lifted by a string attached near



Gyroscope.

one end of the axis (fig. *a*) without the gyroscope's falling. Its axis still projects horizontally from the string, but it revolves as a whole round the string. Various other singular experiments may be made with this apparatus; and others, even more curious, with the gyrostat of Sir W. Thomson, which is simply a gyroscope enclosed in a rigid case, by which the ends of its axis are supported. When a gyrostat is made the bob of a pendulum under certain conditions, the plane of vibration of the pendulum turns, as in Foucault's celebrated experiment, but in general at a much greater rate.

H



the eighth letter in our alphabet, is derived from the Phœnician letter *cheth*, which was obtained from the Egyptian hieroglyphic symbol which goes by the name of the sieve—see ALPHABET. The Semitic name, which means a 'fence' or 'palisade,' is explained by the form of the letter 𐤇, which resembles a three-barred stile. The sound was that of a strongly marked continuous guttural, produced at the back of the palate, which does not exist in English, but is heard in the Scotch *loch* and the German *lachen*. When the Phœnician alphabet was transmitted to the Greeks the name *cheth* became *eta*. As early as the 7th century B.C. this sign had two values among the Greeks; it normally represented the long *ē*, but was permissively used for the simple aspirate *h*. In the alphabet of Italy it was used exclusively for the aspirate; but in the later alphabet of Greece the two sounds came to be represented by a differentiation of the symbol, the form H being used for the vowel and the mutilated forms ⊢, ʟ, for the aspirate. Hence we see how the symbol H stands for *h* in the Latin alphabet and for *ē* in the Greek.

In Old English *h* was a guttural, or throat-sound, but it gradually softened down to a spirant, and has now become almost a vowel. No letter is more misused, and this misuse is of very ancient date. In Latin MSS. and inscriptions it is sometimes improperly inserted, as in the words *harena*, *harunda*, *hauctoritas*, or improperly omitted, as in *omini*, *abitat*, *onustus*—spellings which prove the uncertainty of the usage. In English as early as the 12th century we find *ard* written for *hard*, and *hold* for *old*. Americans, as a rule, rarely misuse it, and in England an untaught peasant is usually more correct than a self-made man. It has long disappeared from Italian, and is now rapidly vanishing from French. The Spaniards substitute *h* for a Latin *f*, the Spanish *hijo* representing the Latin *filius*, just as the Latin *hordeum* represented the Sabine *fordeum*. Not only *f*, but *c* and *s* are frequently represented by *h*. Thus, *hundred* and *century*, *heartiness* and *cordiality*, *hall* and *cell* are true doublets, while the Latin *canis*, *centum*, and *caput* correspond to the English *hound*, *hundred*, and *head*, and the first syllables of *hexagon* and *heptarchy*, which are derived from the Greek, correspond to the English numerals *six* and *seven*. We get *hemi*-sphere from the Greek and *semi*-circle from the Latin, *hyper*-critical from the Greek and *super*-ficial from the Latin. The Irish have retained *s*, which in Welsh has faded down to *h*, the Welsh *hen*, 'old,' being the Irish *sen* and the Latin *senex*. In English *h* has been lost in the words *it*, *eaf*, *nick*, *ring*, *tear*, *fir*, which were formerly written *hit*, *hlaf*, *hnecca*, *hring*, *taher*, and *feoh*, while in *droht* and *genoh*, now written *draft* and *enough*, it has become *f*, and in the words *huge*, *wharf*, *whelk*, and *whelm* it is intrusive. In *hwit* and *hweol*, and many other words, the decay of the aspirate caused them to be written *white* and *wheel*, and except in the north of England the *h* in these words is hardly heard. In the west and south of England, which are Saxon, the aspirate as a rule is fainter and more liable to be lost than in East Anglia, Yorkshire, and Scotland, where we have the descendants of Angles and Danes.

The correct pronunciation of this difficult letter is one of the most delicate tests of good breeding. The quality of the sound depends partly on that of the following vowel, and its intensity to some extent on the accentuation. The aspiration is stronger in *humble* than in *humility*, in *human* than in *humane*, in *history* than in *historical*, in *hostile* than in *hostility*, but it is the same in *happy* and *happiness*, since the accent rests on the same syllable. It is stronger in *who* than in *when*, in *hole* than in *whole*. In *honour* it is very faint, in *honourable* and *honesty* it is almost inaudible. It is stronger in *host* than in *hospital*, while in *hostler* it has so completely disappeared that the spelling *ostler* has become usual. It is retained in *harbour*, but has been lost in *arbour*. It is retained in *hair* and *hare*, but is evanescent in *heir* and *hour*, though retained in *hereditary* and *horologe*. No general rule can be laid down for the pronunciation; it depends on the usage of good society, which changes from generation to generation. In good French society the aspirate is disappearing; in England and America the reverse is probably the case. The reasons why persons who omit *h* where it should be inserted and commonly insert it where it should be omitted are obscure, but have been referred by Mr Douse in his book on *Grimm's Law* to what he designates as the Principle of Cross Compensation.

In German musical notation the letter H is used to denote B natural, the letter B being applied to our B flat. This anomalous distinction is derived from the ancient notation by letters, before the invention of the stave, in which B natural was written in a square form (B *quadratum*), like a small black letter h, while B flat was written as a Roman b (B *rotundum*). The awkwardness of having two B's led to the introduction of the H, which in small black letter (h) resembles h closely. See 'Accidentals' in Grove's *Dictionary*. In the French and Italian system the same note is denoted by the syllable *Si*. See MUSIC, SCALE, SOLFEGGIO.

Haag, CARL, German painter, born 20th April 1820, at Erlangen, studied at Munich (under Cornelius) and at Rome. In 1847 he settled in England, at the same time abandoning oil for water-colours. His earlier pictures represented scenes from Tyrol and Dalmatia, and from the life of the English royal family in Scotland. His later works have been mostly illustrative of oriental subjects, such as the life of the Bedouin of the desert, the ruins of Baalbek and Palmyra, and similar themes.

Haarlem, a town of Holland, 10 miles W. of Amsterdam, is intersected, like most Dutch towns, with canals and avenues of trees. Of its churches the principal is the Great or St Bavon's, a Late Gothic basilica, built in the 15th century, one of the largest churches in Holland, and specially noted for its lofty tower and its organ (1738), long esteemed the largest and finest ever constructed.

Before the church stands a statue of Laurens Coster (q.v.), to whom his countrymen ascribe the invention of printing. The town-hall, formerly the residence of the Counts of Holland, has portraits by Franz Hals, and a valuable collection of early printed works. The Teyler Institution promotes the study of theology, natural science, and the fine arts. Although Haarlem is no longer celebrated, as it was in the 17th century, for its flourishing trade, it still weaves cotton, casts type, bleaches linen, and carries on an extensive trade in flowers, especially in tulips, hyacinths, and other bulbs. It was a flourishing town as early as the 12th century, when it took an important part in the wars between the Hollanders and West Frisians. At the close of the 15th century it was deprived of its privileges by Albert of Saxony, and it suffered severely during the revolt of the peasantry (1492). During the war of independence it underwent a seven months' siege (1572-73) from the Spaniards, in which the citizens displayed the noblest heroism. The wood of Haarlem is a favourite place for recreation; in it stands the 'pavilion,' which contains the colonial and industrial museums and a collection of modern pictures. Pop. (1876) 34,132; (1894) 58,390.

Haarlem Lake, which is now drained (see POLDER), lay between the towns of Haarlem, Leyden, and Amsterdam, and communicated with the Zuider Zee by the Y. Originally it embraced four small lakes, which, in consequence of several irruptions of the sea, eventually merged into one sheet of water, covering an area of about 45,230 acres. The depth did not exceed 15 feet; the floor of the lake was largely composed of mud and clay, from which the Dutch prepared 'klinkers,' bricks used for purposes of paving. The lake frequently rose during storms to an alarming height, necessitating a large annual outlay in keeping the dams and sluices in repair. In consequence of the damage done to Amsterdam and Leyden by two successive overflows of the lake in 1836, the government seriously addressed itself to the task of draining it (1839–52). This undertaking was effected by digging all round the lake a large canal, into which its waters were pumped by three gigantic engines. By these means the waters were drained off to the Y and Zuider Zee. The enterprise cost £1,080,000, but the sale of the lands reduced this outlay by £780,000. The population increased from 7000 in 1860 to 16,000 in 1895.

Habakkuk (Heb., 'embrace'), one of the twelve minor prophets of the Old Testament. His personal history is unknown. In his book he appears as a prophet of Judah, announcing the divine chastisement which is to come upon his nation at the hands of the Chaldean Nebuchadnezzar. He was the first of the prophets who saw in the great victory of Carchemish (Circesium), in the fourth year of Jehoiakim, the fall of the Egyptian supremacy before the young Babylonian king. His period is thus fixed in the last decade of the 7th century B.C. Both as a poem and as a prophecy his book holds a very high rank among the Old Testament scriptures. His aim was to inspire his nation with trust in Him who is the God of Israel from everlasting, his 'Holy One' (i. 12). After asking God why he had so long suffered his prophet to cry in vain for deliverance from the sight of iniquity and grievance (i. 2–4), he gives a vivid description of the Chaldeans (i. 5 *et seqq.*). Then he betakes himself in spirit to his watch-tower (chap. ii.), and sees that this violent nation shall at last become the scorn of the nations it has spoiled, its idols will be of no avail: 'Jehovah is in his holy temple; let all the earth keep silence before him' (ii. 20). From this prospect he rises to the prophetic height of the third chapter, which is a majestic hymn describing in the most striking images the appearance of the Almighty for judgment, and ending (16–19) with the impression produced by this prophecy on himself, and a beautiful expression of his confidence in God, whatever may befall. The keynote of the whole prophecy is the sentence in ii. 4: 'the just shall live by his faith,' quoted by St Paul in Rom. i. 17, and Gal. iii. 11. The best commentaries on Habakkuk are those of Delitzsch (1843), Hitzig (3d ed. 1863; 4th ed. by Steiner, 1881), Ewald (1867; Eng. trans. in vol. iii. of his *Prophets*, 1878), Kleinert (1869), and Keil (1873).

Habberton, JOHN, author, was born in Brooklyn, New York, 24th February 1842, served through the civil war, and was for some years a clerk, afterwards turning to journalism. His best-known book is *Helen's Babies* (1876), which attained an astonishing popularity both in America and in Europe. He has published also *The Barton Experiment* (1877), *Other People's Children* (1877), *The Worst Boy in Town* (1880), *Who was Paul Grayson?* (1881), a humorous Life of Washington (1883), *One Tramp* (1884), *Brueton's Bayou* (1886), and other works.

Habeas Corpus, in English law, is the formal commencement of several writs, issued by the superior courts, which direct a person who has another in custody to produce the body of the prisoner. Such writs are or have been used in practice for various purposes. Thus, the *habeas corpus ad respondendum* was used to bring up a prisoner to serve him with a writ; and the *habeas corpus ad testificandum* may still be used to bring up a prisoner to give evidence. But the best-known and by far the most important form of the writ is the *habeas corpus ad subjiciendum*, by which the person detaining another in custody is ordered to bring up his prisoner, and to state the reasons for such detention, that the court may judge of their sufficiency. This 'prerogative writ' is one of the chief securities of English liberty. By the law of England, as embodied in the Great Charter, no freeman could be imprisoned except for a crime of which he was found guilty by his peers, or for a civil debt. The effect of this rule of law was that the executive government had no right to imprison an individual on suspicion, or for an indefinite period. Arrest and imprisonment could only be justified by making a definite charge against the prisoner, and by putting him on his trial before a jury without unreasonable delay. A person illegally imprisoned could demand of the Court of King's Bench a writ of *habeas corpus;* and on return being made to the writ, the court might discharge the party, or admit him to bail, or send him back to await his trial, according to the nature of the case. This was the rule of law; but it need hardly be said that in despotic times the courts could not be relied on to protect the subject against illegal imprisonment. In the reign of Charles I. the judges refused to issue a *habeas corpus* in vacation time. They also assumed a discretionary power to grant or refuse the writ; and the government sometimes evaded the law by sending prisoners beyond the sea, to Jersey and other places. These abuses led in 1679 to the enactment of the statute 31 Car. II. chap. 2, commonly known as the Habeas Corpus Act. This act did not, as is often supposed, introduce any new form of process; but it secured to the subject the ancient constitutional remedy of which the weakness of the judges and the bad faith of the government had deprived him. The writ may be sued out by motion in court, or by an application to the Lord Chancellor or one of the judges, supported

by affidavits showing that the person on whose behalf the motion or application is made is illegally detained. The chief rules of the act are as follows. When a person is committed to prison the judge to whom application is made must, unless there has been great delay in making the application, grant the writ of *habeas corpus*. The writ must be obeyed, more or less promptly according to the distance; but in no case must the delay exceed twenty days. Any officer who refuses the prisoner a copy of the warrant of commitment, or who shifts the prisoner to another custody without authority, forfeits £100, and for the second offence £200, and is disabled to hold office. No person once delivered by *habeas corpus* may be recommitted for the same offence under a penalty of £500. A person committed for treason or felony may insist on being tried in the next term or session, or admitted to bail, unless the crown witnesses cannot be ready: if not tried in the second term or session he must be discharged. Any judge who denies the writ forfeits £500. This is now the only case in which a private person may take proceedings against a judge in respect of an act done in his judicial capacity.

The Habeas Corpus Act extends only to the cases of persons imprisoned on criminal charges; but in 1816 its provisions were extended to other cases by the 56 Geo. III. chap. 100. The result of these enactments is that in all cases where any person, whether man, woman, or child, is deprived of liberty, some friend may apply for a *habeas corpus* directed to the officer or private person having custody of the prisoner. Refusal to make any return to the writ will of course be dealt with as contempt of court. If the party is detained by lawful authority (e.g. in the case of a child in the care of its parents, or a dangerous lunatic privately kept under restraint by his friends) the facts must be stated in the return. If the alleged authority is of a formal character (e.g. a warrant of commitment, or a certificate of lunacy) it must be produced, and the court will judge of its legal sufficiency. A writ of *habeas corpus* runs in any county palatine or privileged place, in the Channel Islands, and the Isle of Man. In the case of Anderson, a slave who in 1853 had escaped to Canada after killing a Missouri planter, it was held that the writ might be applied for by a person confined in a colony; but an act passed in 1862 provides that the writ shall not run in any colony where there is a court having authority to grant a *habeas corpus*.

The law of *habeas corpus* does not extend to Scotland; but the subject is protected by the Wrongous Imprisonment Act, 1701, chap. 6, which is often called the Scotch Habeas Corpus Act. In Ireland there was no Habeas Corpus Act until 1783; and the provisions of the law then passed have frequently been suspended by acts arming the government with exceptional powers. The protection of *habeas corpus* is secured to American citizens by the constitution of the United States, and by the constitution of most of the states. The state courts do not discharge persons imprisoned by order of federal courts; nor will the federal courts interfere with persons imprisoned under state process.

In times of rebellion or disturbance the government may find it necessary to arrest dangerous persons, and to detain them in custody without bringing them to trial. In such cases the government may either break the law and apply to parliament for an Act of Indemnity, or it may invite parliament to suspend the Habeas Corpus Act for a time. In 1881, for example, the Irish government was empowered to detain without trial all persons reasonably suspected of complicity in treason and crime. In the United States, Merryman's case, in 1867, gave rise to a keen discussion, some eminent lawyers maintaining that the president, of his own authority, could suspend the law of *habeas corpus*, others contending that the power of suspension could only be exercised by congress. For the history and law of Habeas Corpus, see Blackstone's *Commentaries*, Hallam's *Constitutional History*, Story's *Commentaries on the Constitution of the United States*, &c.

Habergeon. See HAUBERK, ARMOUR.

Habington. WILLIAM, poet, was born at Hendlip in Worcestershire, November 4, 1605. His family was Catholic; his uncle was executed, and his father lay six years in the Tower, for complicity in Babington's plot. He was educated at St Omer, but declined to become a Jesuit, and was next sent to Paris. He married Lucy Herbert, daughter of the first Lord Powis, and has immortalised her in his *Castara*, a collection of lyrical poems, some of rare beauty and sweetness, and stamped throughout with a purity then unusual. It was first published in quarto in 1634. His father died in 1647, and he himself, says Wood, 'who did then run with the times and was not unknown to Oliver the usurper, died on the 30th of November 1654.' Other works of Habington were *The Historie of Edward the Fourth* (1640); *The Queene of Arragon, a Tragicomedie* (1640); and *Observations upon Historie* (1641).

Habit. See HEREDITY, INSTINCT, REFLEX ACTION, VARIATION, ASSOCIATION OF IDEAS, CAUSALITY, ETHICS.

Habit and Repute, a phrase used in Scotch law to denote something so notorious that it affords strong and generally conclusive evidence of the facts to which it refers. The best-known example of this is where a man and woman cohabit as husband and wife, and are reputed by the neighbours to be married, in which case the law of Scotland accepts the cohabitation and the proof by public opinion as evidence that a marriage has been contracted by the parties by the interchange of consent. In England no such doctrine prevails, and the marriage would have to be proved in the usual way, if called in question, by a suit which directly raises such question, though the parties had all their lives lived together as man and wife.—There is also in Scotland an application of the doctrine of habit and repute to persons when convicted of stealing; for if the individual is a habit and repute thief—i.e. a notorious thief—the repute that the accused gets his livelihood or supplements it by thieving is technically an aggravation of the offence, and may be charged and proved as such; nor is it necessary to the establishment of such a charge that the accused should have been previously convicted. In England and Scotland a somewhat similar effect is produced more circuitously, by proving that the thief has been several times previously convicted (is a 'habitual criminal'), in which case he is generally punished by a severer sentence.

Habitual Drunkards. See INEBRIATES.

Habsburg. See HAPSBURG.

Hachette, LOUIS, French publisher, was born at Rethel in the Ardennes, on 5th May 1800. In 1826 he established in Paris a publishing business, principally with the intention of issuing books calculated to improve school teaching and elevate the general intelligence. In pursuance of his plan he has published several series of books, as the *Bibliothèque populaire*, *Bibliothèque variée*, &c., which have done most useful service in disseminating information and amusement among the people. He also deserves to be mentioned as a friend of the

working classes, and as the promoter of international copyright. He died 31st July 1864.

Hackee, a name for the Chipmunk (q.v.).

Häckel, Ernst. See Haeckel.

Hackberry, See Nettle Tree.

Hackbut. See Firearms.

Hackensack, a post-village, capital of Bergen county, New Jersey, on the Hackensack River, 12 miles by rail N. of Jersey City. It has several factories. Pop. 4983.

Hackländer, Friedrich Wilhelm von, a German novelist and comedy writer, was born at Burtscheid, near Aix-la-Chapelle, 1st November 1816. After one or two false starts in life, he commenced his literary career with *Bilder aus dem Soldatenleben* (1841), and three years later followed up his success with *Das Soldatenleben im Frieden* (9th ed. 1883). The truth and pleasant humour of these books induced Baron von Taubenheim to invite Hackländer to accompany him on his travels to the East. The literary fruits of this journey were *Daguerreotypen, aufgenommen auf einer Reise in den Orient* (2 vols. 1842), and *Pilgerzug nach Mekka* (1847; 3d ed. 1881), a collection of oriental tales and legends. In 1843 he was appointed private secretary to the crown-prince of Würtemberg, with whom he travelled in the succeeding years. In March 1849 he went to Italy, was present with Radetzky's army during the campaign in Piedmont, and afterwards published *Soldatenleben im Kriege* (2 vols. 1849–50). From 1859 onwards he lived for the most part in Stuttgart, partly also at Leoni on Lake Starnberg (or Würm) near Munich, and died at the latter place, 6th July 1877. The best of his longer novels are *Handel und Wandel* (1850; 3d ed. 1869), *Eugen Stillfried* (1852), and *Namenlose Geschichten* (1851). Accurate portraiture of actual life, mostly its external aspects, and a genial humour are the most outstanding characteristics of these works. His best comedies are the *Geheimer Agent* (1850), which has been performed on all the stages of Germany, and translated into several European languages, and *Magnetische Curen* (1851). Along with Zoller he started the illustrated magazine *Ueber Land und Meer*. A collected edition of his works was published at Stuttgart in 60 vols. 1855–74. See his posthumous *Roman meines Lebens* (2 vols. 1878).

Hackmatack, See Larch.

Hackney, a parish of Middlesex, now forming a suburb of London, and 3 miles NNE. of St Paul's. It was at one time a favourite suburban residence of the London citizens, but, the current of fashion having for many years been setting to the west, Hackney no longer holds the rank it formerly did. In its earlier and fashionable days it is by some said to have given its name to hackney-coaches. See Cabs.

Haco V., surnamed the Old, king of Norway from 1223 to 1263. During his reign Greenland and Iceland were added to the Norwegian crown. Haco died in the Orkneys on his way home from Scotland, where he had fought the battle of Largs (q.v.) against Alexander III. See Norway.

Haddington, the county town of Haddingtonshire, lies at the southern base of the Garleton Hills, on the Tyne, 17 miles E. of Edinburgh. Its Abbey Church, the *Lucerna Laudoniæ* or 'Lamp of Lothian,' is a cruciform Decorated red sandstone pile, with a central tower 90 feet high, and ruinous all but the nave (the parish church), restored 1891–92. Then there are the county buildings (1833), the large corn exchange (1854), the town-hall (1748–1831), the county lunatic asylum (1866), and a school, the Knox Memorial Institute (1880). Haddington's worthies have been Knox, John Brown and Samuel his grandson, Samuel Smiles, and Jane Welsh Carlyle, whilst its chief memories have been perils by flood and fire, and the great siege of the English by the Scotch in 1549. An ancient royal burgh, it united till 1885 with North Berwick, Dunbar, Jedburgh, and Lauder to return one member to parliament. Pop. (1831) 3857; (1881) 4043; (1891) 3770. See works by James Miller (1844) and John Martine (1883).

Haddingtonshire, or East Lothian, a maritime county of Scotland, washed on the north for 32 miles by the German Ocean and the Firth of Forth. Its utmost length is 26 miles, its utmost breadth 19, and its area 280 sq. m. In the south are the Lammermuir Hills, culminating in Lammer Law (1733 feet); whilst isolated heights are North Berwick Law (612), Traprain or Dumpender Law (724), and the Garleton Hills (594), on which stands a conspicuous column, erected in 1824 to the fourth Earl of Hopetoun. The Tyne, flowing 16 miles north-eastward through the county, is its only considerable stream. The rocks are variously Silurian, sandstone, volcanic, and carboniferous, and yield coal, iron, and limestone, the coal having been mined near Tranent since the 13th century. The annual rainfall is 25 inches, and the mean temperature 46° F. Thanks to a long series of skilled agriculturists, from John Cockburn of Ormiston to Mr Hope of Fenton Barns and onwards, Haddingtonshire has for two hundred years enjoyed high agricultural fame, having been the first Scottish county to adopt the sowing of turnips in drills (1734), the thrashing-machine (1787), and the steam-plough (1862). About 64 per cent. of the entire area is in cultivation, and more than one-seventeenth is under wood. The county returns one member to parliament. Its towns are Haddington, Dunbar, North Berwick, Prestonpans, Tranent, and East Linton; and under these and the Bass Rock are noticed the chief events in its history. The antiquities include the ruined castles of Dirleton and Tantallon. Pop. (1841) 35,886; (1881) 38,502; (1891) 37,491. See Lothian, and works by D. Croal (3d ed. 1885) and J. Small (1883).

Haddock (*Gadus æglefinus*), a fish of the same genus with the cod, and much resembling it in general appearance. The number of fins is the same as in the cod, there being three dorsals and two anals. The haddock, like the cod, has a barbule at the point of the lower jaw. The haddock is brown on the back, silvery on the belly; the lateral line is black, and there is a black spot behind each of the pectorals, these spots sometimes extending so as to meet on the back. An ancient legend ascribes these spots to the finger and thumb of St Peter, and states the haddock to be the fish from the mouth of which he took the tribute-money, 'the inventors of the legend never adverting to the improbability of a marine fish living in the fresh-water lake of Gennesaret.' The haddock, indeed, is not found even in the Mediterranean. Nor does it enter the Baltic, although plentiful in the northern parts of the Atlantic Ocean, both on the European and the American coasts. On the British coasts it is abundant almost everywhere, appearing in great shoals at particular seasons, but in size and quality the haddocks taken at one part of the coast differ much from those of another. Those of the east coast, and particularly those caught in deep water, are in great esteem, and those of Dublin Bay are remarkable for their large size. A haddock of 16 lb. has been taken in Dublin Bay. Generally, however, this fish is much smaller. It is taken both by trawl-nets and lines. The usual bait for the long lines used to catch this fish on the east coast of Britain is mussel. The haddock, when

really of good quality, is perhaps the finest of all the Gadidæ; and the numbers taken on some parts of the British coasts are very great, rendering it, from an economical point of view, a very important fish. It does not 'take salt' so well as the cod, but is often cured by drying and smoking. In March and April the haddock is out of season; in October, November, December, and January it is in finest condition. Smoked *Finnan Haddocks* are named from the fishing village of Finnan or Findon (q.v.), in Kincardineshire.

Haddon Hall, an old English baronial mansion, the seat successively of Avenells, Vernons, and the Rutland family, stands on a slope overlooking the Wye in Derbyshire, 23 miles NNW. of Derby. The styles of architecture range from Norman to the 16th century. Reference is made to it in Scott's *Peveril of the Peak*. See two works with illustrations by Cattermole (1846-67); S. C. Hall's *Haddon Hall* (1871); *Quarterly Review* (1890); and *Haddon Hall, illust. by W. E. Cooke* (1892).

Hade. See DISLOCATION, ORE, DEPOSITS.

Haden, SIR FRANCIS SEYMOUR, who both by his writings and by the etching needle has contributed to the revival of interest in etching, was born in London on 16th September 1818. He is by profession a surgeon, and was in 1857 elected a Fellow of the Royal College of Surgeons. His work in connection with etching was undertaken tentatively in 1843, and earnestly in 1858, as a relaxation from professional labours. The *Etched Work of F. S. Haden* contains 185 plates from his hand; others have been published in *Etudes à l'Eau Forte* (1865-66). The chief qualities of his work are vigour and breadth. President of the Society of Painter Etchers, he was knighted in 1894, and has written *Etched Work of Rembrandt* (1879-80), *Lectures*, and *About Etching* (1881).

Hadersleben, or HADERSLEV, a town of Sleswick-Holstein, situated 32 miles N. of Flensborg, on the Hadersleben Föhrde, a narrow arm of the Little Belt. It has an iron-foundry, and machine and tobacco factories. Pop. 7635.

Hades, in Greek religion, the name applied to the kingdom of the under-world, the abode of the departed spirits or shades. Hades and Pluto (q.v.) are also personal names for its king. It is the Greek word by which the Septuagint translates the Hebrew *sheol*, the abode of the dead, in which sense it occurs frequently in the New Testament. See HELL.

Hadith. See MOHAMMED, SUNNITES.

Hadji. See HAJJ.

Hadleigh, a quaint old market-town of Suffolk, on the Bret, 9½ miles (12½ by a branch line) W. of Ipswich. Its chief buildings are the brick Rectory Tower (1495) and the noble parish church, with a spire 135 feet high. Formerly, from 1331, an important seat of the cloth-trade, Hadleigh was the scene of the death of the Danish king Guthrum (889), of the martyrdom of Dr Rowland Taylor (1555), and of the 'great conference' (1833) out of which grew the 'Tracts for the Times,' and at which Newman, Hurrell Froude, Trench, and Rose, the then rector, were present. Pop. of parish (1851) 3746; (1891) 3229.

Hadley, JAMES, an American philologist, was born at Fairfield, New York, 30th March 1821, graduated at Yale in 1842, was for six years tutor and assistant professor there, and was professor of Greek from 1851 until his death at New Haven, 14th November 1872. He was one of the American committee for the revision of the New Testament. Hadley published a Greek grammar and *Elements of the Greek Language* (1869); after his death a volume of lectures on Roman Law appeared, and a series of *Philological and Critical Essays* (1873; ed. by Professor W. D. Whitney).

Hadley, JOHN, an English mathematician, the inventor of Hadley's quadrant (see SEXTANT) and of a reflecting telescope (1723). The honour of having invented the sextant is claimed for Hadley, Godfrey, and Newton. Each seems, however, to have made his own discovery independently. Hadley described his instrument, which he called an 'octant,' to the Royal Society on 13th May 1731. He contributed several papers to the *Transactions* of the society from 1717 onwards. Born in 1682, he died 14th February 1744.

Hadramaut, the name commonly given to the coast region of South Arabia from Aden to Cape Ras-al-Hadd, but by modern Arab geographers restricted to the region lying approximately between 48° and 51° E. long. It consists of a plateau, parted from a mountain-chain, the barrier of the interior desert, by a complex of valleys. Commerce, agriculture, cattle breeding, and the chase are the chief occupations. The climate is dry but healthy. Pop. about 150,000. Nominally the people are subject to Turkey, but the social and political conditions of the district are very similar to those of the former feudalism of Europe. Chief towns, Saiun and Terim, the former the seat of a celebrated Arab seminary. See Van den Berg, *Le Hadhramout* (1886).

Hadrian, PUBLIUS ÆLIUS HADRIANUS, Roman emperor from 117 to 138 A.D., was born at Rome in 76. During the reign of Trajan, who was his guardian and kinsman, he filled several high offices in the state, and in his earlier life devoted himself with such ardour to the study of Greek as to earn the nickname of Græculus. He accompanied the emperor in his wars against Decebalus, where he distinguished himself by his bravery; and in 117, when Trajan set out on his return to Italy, he was left behind with the army as prefect of Syria. When the intelligence reached Antioch that Trajan had died in Cilicia on his journey home, Hadrian was proclaimed emperor by the army, August 11, 117 A.D. The state of the empire at the time was extremely critical. Insurrections had broken out in Egypt, Palestine, and Syria; Mœsia in the east and Mauritania in the west were both invaded by barbarian hordes; while the Parthians had once more asserted their independence, and won several successes over the imperial forces. Hadrian, perceiving the advantage of a peaceful policy, wisely resolved to limit the boundaries of the Roman dominion in the East, and concluded a peace with the Parthians, surrendering to them all the country beyond the Euphrates. After appeasing the Roxolani and Sarmatæ, who had made an inroad into Mœsia, he repaired to Rome, where he had been already acknowledged by the senate, established his authority by liberality towards the people, and suppressed with great severity a patrician conspiracy against his life. In the year 119, for the purpose of becoming acquainted with the state of the provinces, he commenced his celebrated journey, which he is said to have performed chiefly on foot, marching bareheaded 20 miles a day and sharing cheerfully the hard fare of the humblest soldier. He visited Gaul, Germany, Britain, where he built the famous wall extending from the Solway to the Tyne, Spain, Mauritania, Egypt, Asia Minor, and Greece, whence he returned to Rome after his circuit of the empire in 126 or 127 A.D., and received the title of *Pater Patriæ*. Hadrian spent the years 132 and 133 in Athens, which city he adorned with splendid and costly buildings. After once more visiting Syria and crushing a desperate Jewish revolt, he returned to Italy, and spent the last years of his life at Rome and at his splendid villa

at Tibur. During the severe illness which carried him off, July 10, 138, at Baiæ, he was subject to violent outbursts of cruelty, to which, as well as to jealousy and pleasure, he was naturally subject. After the death of Lucius Ceionius Commodus, whom he had adopted under the name of Lucius Ælius Verus, he appointed Titus Aurelius (afterwards the Emperor Antoninus Pius) his successor. During his reign the army was vigorously disciplined and reorganised, so that the barbarians were not likely to attribute Hadrian's conciliating and peaceful policy to fear or weakness. As a civil ruler he merits high praise for the just and comprehensive view he appears to have taken of his duties as a sovereign. Hence to him is attributed, more than to any other, the consolidation of the monarchical system of Rome. Hadrian also divided Italy into four parts under four consuls, to whom was entrusted the administration of justice. Hadrian had a passion for building: his most splendid edifices were the mausoleum called the *Moles Hadriani*, in Rome, the nucleus of the present castle of St Angelo, the Ælian bridge leading to it, and the magnificent villa at Tibur. He likewise laid the foundation of several cities, the most important of which was Adrianopolis. He was a lover of the fine arts—in the history of which, as well as of jurisprudence, his reign forms an important era—of poetry, philosophy, and rhetoric, all of which he attempted. He set a high value on Greek literature, and likewise on the cultus of Greece, and caused himself to be initiated into the Eleusinian mysteries. No fragment of ancient literature has been more famous than the verses attributed to the dying Hadrian:

Animula vagula blandula
Hospes comesque corporis,
Quæ nunc abibis in loca?
Pallidula rigida nudula,
Nec ut soles dabis jocos.

Mr David Johnston, in his *Translations, literal and free, of the dying Hadrian's Address to his Soul* (privately printed, Bath, 1877), gives no fewer than 116 translations of all degrees of excellence. Many of these have read into the poem a kind of Christian or Neoplatonist spirituality which is not really in it, its aim being rather to emphasise the miserable state of the soul as soon as it ceases to enjoy the friendly hospitality of the body. Lord Carnarvon, in vol. iv. (1884–85) of *The National Review*, gives versions of it by Byron, Prior, two by Pope, one by Dean Merivale, and another by himself. Of these, Prior's is undoubtedly the best, although the freest rendering; Byron's, the poorest; while the second of Pope's—the well-known 'Vital spark of heav'nly flame'—is not properly a translation at all.

See Merivale's *History of the Romans under the Empire*, vol. viii.; W. W. Capes's *Age of the Antonines*, in 'Epochs of Ancient History;' Gregorovius, *Der Kaiser Hadrian* (1884); and Dürr, *Die Reisen des Kaisers Hadrian* (1881).

Hadrian's Wall. Before Agricola advanced into Scotland he planted some forts on the neck of land between the estuary of the Tyne and the Solway Firth, to protect him from attack in his rear and to secure the bringing up of supplies. He adopted the same precaution before leaving the Lowlands of Scotland for the Highlands, placing encampments between the firths of Forth and Clyde. Afterwards walls were constructed on these two lines. On the English side of the Border we find a stone wall with a ditch on its north side. Attached to it are stationary camps, mile-castles, and turrets for the accommodation of the soldiery who manned it. To the south of the stone wall is a series of ramparts generally called the *vallum*. This fortification consists of three aggers or mounds and a ditch. The military way along which the soldiery moved lies between the *murus* or stone wall and the vallum. The wall was not intended as a mere fence to block out the Caledonians, but as a line of military strategy. Every station and mile-castle has a wide gateway opening northwards. This does not look as if the Romans in the time of Hadrian had given up the country north of the wall to the enemy. Besides, two Roman roads, the

Map showing the line of Hadrian's Wall.

Watling Street and the Maiden Way, run past the wall into Scotland. On these ways were stationary camps, which have yielded inscriptions and coins considerably posterior to the time of Hadrian or Severus. A controversy long existed as to the time when the lines of fortification in the north of England were constructed. One great authority, the Rev. John Horsley, author of the *Britannia Romana* (1732), maintained that the north agger of the vallum was reared by Agricola, and that it was the road by which his forts were connected, that the ditch and the other two aggers were the work of Hadrian, and that the wall was reared by Severus. Stukeley (1687–1765), however, expressed the opinion that both vallum and murus 'were made at the same time, and by the same persons, and with the intent that the vallum should be a counterguard to the other, the whole included space being military ground.' Since Horsley's day inscriptions in honour of Hadrian have been found in four of the mile-castles in the central part of the line, and, as the mile-castles are an essential part of the wall, Hadrian is now generally believed to have been the builder of the whole structure. Severus, however, repaired it before he advanced into Scotland, where in three years he lost 50,000 men, and came back to York to die. Agricola came to Britain in 78 A.D. Hadrian came towards the close of 119 A.D. Severus died in 211 A.D. Towards the close of the 4th century Theodosius, for a brief period, reasserted the Roman dominion over the district between the walls of Antoninus (q.v.) and Hadrian, which, in honour of the Emperor Valens, obtained the name of Valentia. But this newly-established province was soon lost, and it was not long before the Romans finally abandoned Britain. Considerable portions of Hadrian's Wall yet remain. In two places the wall stands 9 feet high. See Collingwood Bruce, *The Roman Wall* (1851; 3d ed. 1866), and *Handbook to the Roman Wall* (1863; 5th ed. 1885); and Neilson, *Per Lineam Valli* (1891).

Hadrosaurus, the name given to a very large Dinosaurian (q.v.) of the Cretaceous epoch, whose remains have been found abundantly in New Jersey.

Haeckel, Ernst Heinrich, a distinguished German naturalist, born 16th February 1834, at Potsdam. He studied natural science and medicine at Würzburg, Berlin, and Vienna under Müller, Virchow, and Kölliker; and soon became distinguished for his enthusiasm and originality in zoological studies. After working for a while at Naples and Messina, he became a *privat-docent* in the university of Jena in 1861, a professor *extraordinarius* in 1862, and an ordinary professor of Zoology in 1865. In this position, in spite of other inducements, Haeckel has remained working indefatigably in his zoological institute, interrupted only by visits to the North Sea shores and the Mediterranean, or by more extended travels—e.g. to Madeira, the Canaries, Morocco, south Spain, Arabia, India, and Ceylon.

The most important of his numerous systematic works are the following: a monograph on the radiolarians (*Die Radiolarien*, 1862), with a superb atlas of 35 plates; the classic work on calcareous sponges (*Die Kalkschwämme*, 1872), important both in relation to these animals and in its practical illustration of general problems such as the nature of species; a yet larger work on jelly-fishes (*System der Medusen*, 1879), with an atlas of 40 plates, which like all Haeckel's work display inborn artistic talent unsurpassed among naturalists; several smaller works, such as that on the development and division of labour of the *Siphonophora* (1869), or that on the *Monera* (1870), in which he ranks under the title *Protista* the lowest forms of life which have not taken a decisive step towards plants or animals, or that on *Arabian Corals* (1876); and finally his monumental contributions to the *Challenger* Reports on *Deep-sea Medusæ* (1882), with 32 plates; on *Siphonophora* (1888), and especially on *Radiolaria* (1887), in three volumes, with 140 plates and 3500 new species.

With the above gigantic descriptive work Haeckel has combined two rarer accomplishments, successful generalisation and popular exposition. His *Generelle Morphologie* (2 vols. 1866), in its reasoned orderliness and clear generalisations, ranks beside Spencer's *Principles of Biology;* it is not only one of the very few works of moment on general morphology, but is greater than its name suggests, really including the gist of a series of treatises—e.g. on the commonly avoided subject of organic stereometry—the science of shape or promorphology, on the much-debated problem of individuality, on the various modes of reproduction, on heredity, and on the pedigrees of animals. Besides being one of the first to sketch the genealogical tree (*Stammbaum*) of animals, Haeckel gave precise and luminous expression to the general fact that the life-history of the individual is a more or less accurate recapitulation of its historic evolution. As a special application of this 'fundamental biogenetic law' his Gastræa-theory (elsewhere stated) is of paramount importance (see Embryology). Among other general works may be noted his *Perigenesis of the Plastidules* (1876), an ingenious contribution to the theory of Heredity (q.v.), and his speculations on the origin and development of animal tissues (1884).

Apart from detailed zoological work, Haeckel has devoted his life to applying the doctrine of evolution and to making it current coin. Owing much of his motive to Darwin, he stood for a time almost alone in Germany in his championship of a theory not then popular. Before the publication of Darwin's *Descent of Man* Haeckel was the only naturalist who had clearly recognised the import of sexual selection, and of his *Natural History of Creation* Darwin says, 'If this work had appeared before my essay had been written, I should probably never have completed it.' His most important expository works are the above-mentioned *Natürliche Schöpfungsgeschichte* (1st ed. 1868; 8th ed. 1889), which has been translated into twelve languages; 'The Evolution of Man' (*Anthropogenie*, 1874; 3d ed. 1877); and lectures on development and evolution, *Gesammelte populäre Vorträge aus dem Gebiete der Entwickelungslehre* (1878-79). Haeckel's popular works are very brilliantly written, but they are not always so careful in statement as Darwin's classics, and offend many by their remorseless consistency, and by their impatience with theological dogma and teleological interpretation. He has always been set against compromise, defending the freedom of science in a famous pamphlet (*Freie Wissenschaft und Freie Lehre*) written in answer to Virchow. Other works are *Die Medusen* (1880); *Darwin, Goethe, und Lamarck* (1882); *Der Monismus* (1892); and *Systematische Phylogenie* (1894-95).

Like all other naturalists, he has made a few mistakes; there are hints both in some of his drawings and in some of his arguments of the dangers of artistic and speculative imagination; and it may be doubted whether his early championship of evolution and Darwinism has not resulted in a taint of dogmatism in what is sometimes called 'Haeckelismus.' On the other hand, the thoroughness of his systematic labours, the excellence of his draughtsmanship, the clear generalisations of his *Generelle Morphologie*, the geniality of his teaching, and perhaps above all the courage, lucidity, and eloquence of his popular expository work on evolution have raised Haeckel to a pre-eminent position among modern naturalists. See Biology, Darwinian Theory, Embryology, Evolution, Heredity, Zoology.

Hæmatemesis (Gr. *haima*, 'blood,' and *emesis*, 'vomiting'), the ejection of blood from the stomach by vomiting. Its most common causes are gastric ulcer; congestion of the stomach or the neighbouring portions of the alimentary canal (see Stomach, Diseases of); and certain conditions of the blood, as in yellow fever, purpura, and sometimes in typhus. See Bleeding.

Hæmatite (Gr. *haima*, 'blood'), a mineral consisting chiefly of peroxide of iron, is a valuable iron ore. There are two principal varieties, Red Hæmatite and Brown Hæmatite. See Iron.

Hæmatocele (Gr. *haima*, 'blood,' and *kēlē*, 'tumour'), a tumour containing blood; opposed to Hydrocele (q.v.).

Hæmatoxylin. See Logwood.

Hæmatozoa (Gr. *haima*, 'blood,' and *zoon*, 'an animal'), parasites occurring in the blood. (*a*) Some Gregarines (q.v.) live in the blood-corpuscles of frogs, reptiles, and birds. (*b*) A few Nematodes occur in the vascular system—e.g. *Filaria immitis*, in the heart of the dog; *Strongylus armatus*, causing abdominal aneurism, in horse and ass; *Filaria sanguinis hominis*, which in Australia, China, India, Egypt, and Brazil occurs in man, the sexual female in the lymph glands causing Elephantiasis (q.v.), &c., the embryos circulating in the blood and causing hæmaturia, &c., while the larval asexual stages occur within a mosquito. (*c*) A very important blood parasite among Trematodes is Bilharzia (q.v.), occurring in Africa, in the blood-vessels of the bladder, mesentery, and portal system of man. See Bilharzia, Gregarine, Nematode, Parasitism; also Leuckart's *Parasites of Man*, trans. by W. E. Hoyle (Edin. 1886).

Hæmaturia (Gr. *haima*, 'blood,' and *ouron*, 'urine'), the discharge of blood with the urine, usually from disease of the kidneys or bladder. It

is rather a symptom than a disease, and, although always of some gravity, it is not very often directly fatal. Where it is necessary to treat the symptom itself complete rest is very important; the bowels may require to be freely moved; and styptics, such as ergot or perchloride of iron, may be taken by the mouth, the former in thirty-drop doses of the liquid extract, the latter in twenty-drop doses of the tincture, every two or three hours.

Hæmodoraceæ, an order of monocotyledons, consisting of herbaceous plants with fibrous roots and sword-shaped leaves; differing from Iridaceæ in habit, and in having the stamens six in number, or, if only three, opposite to the petals. There are about fifty known species, chiefly natives of America, South Africa, and Australia. Some of them have beautiful liliaceous flowers. A red colour exists in the roots of some; hence the name Blood-root has been given to them (see SANGUINARIA). In this order are ranked the Vellozias or Tree-lilies.

Hæmoglobin. See BLOOD.

Hæmophilia, or the *hæmorrhagic diathesis*, is the name applied to a constitutional peculiarity which manifests itself in a tendency to excessive bleeding when any blood-vessel is injured. In those who suffer from it (*bleeders*) a slight bruise may cause extensive extravasation of blood; a small cut or the extraction of a tooth may lead to dangerous or even fatal hæmorrhage. It is not known whether it is to the blood or the blood-vessels of those affected that the faulty arrest of bleeding is due. The condition is strongly hereditary; and, though it rarely affects women, is often transmitted in the female line. No cure is known for it.

Hæmoptysis (Gr. *ptusis*, 'spitting'), expectoration of blood, a symptom of disease of the lungs or heart, in all cases of great importance, and requiring immediate attention, but apt to be viewed popularly with a somewhat exaggerated alarm. It is seldom directly fatal, but it is often the first announcement of phthisis, and it is a matter of common prudence to seek medical advice on the appearance of even the slightest tinge of blood in the expectoration. Blood which comes from the lungs is *coughed* up, and it is generally bright and frothy. Blood from the stomach is *vomited*, and has the appearance of coffee grounds or hare soup from the action of the gastric juice on it. See BLEEDING.

Hæmorrhage. See BLEEDING; and for hæmorrhagic diathesis, see DIATHESIS, HÆMOPHILIA.

Hæmorrhoids. See PILES.

Hæmus, MOUNT. See BALKAN.

Haff, a word derived from the Danish *hav*, meaning 'sea,' and used to designate three lagoons along the Prussian coast of the Baltic—viz. Stettiner or Pommersches Haff, Frisches Haff, and Kurisches Haff. Haff-fishing or haaf-fishing is a term used by the Shetlanders to signify deep-sea fishing.

Háfiz, the poetical name of Shems ed-Dín (i.e. Sun of the Faith) Muhammed, the greatest of Persian lyrical poets, was born at Shíráz, where he passed all his life and died, according to the inscription on his tomb, 791 A.H. (1388 A.D.), though the year of his death is also given by different authors as 792 and 794 A.H. The date of his birth is not known. His *takhallus* Háfiz signifies one who is learned in the Koran and the *Hadíths*, or sayings ascribed to Mohammed. Little is recorded of his life, which, indeed, seems to have been uneventful. It is probable that he was married, but nothing is known regarding his domestic life. It would appear, from an anecdote related by Ferishtah, that Háfiz once intended making a long and distant journey, notwithstanding his stay-at-home proclivities. The sultan Mahmúd Sháh Bahmaní, who ruled in the Deccan, invited the poet to his court, and accompanied his flattering invitation with a sum of money amply sufficient to defray his expenses. Háfiz had proceeded as far as Lár, on the direct route from Shíráz to Ormuz, a port on the Persian Gulf, whence he could obtain a much shorter and easier passage by sea to the Deccan, and there he met with an old friend, who had been recently plundered by a gang of robbers, and generously gave him a share of his money. A party of merchants conveyed him to Ormuz, where he embarked in a vessel bound for the Deccan. But before the anchor was weighed he was so much terrified at a storm which suddenly arose, that he abandoned his purpose and returned to Shíráz, after despatching a letter of apology to the chief vazír, together with an ode.

According to a curious legend, Háfiz obtained his poetical faculty from the mythical saint, or prophet, El-Khizar (so called from his *green* robe, the emblem of perennial youth), who appeared to him, after he had passed several nights in watching for the coming of that tutelary friend of the Faithful, and who bestowed on him a draught of the Water of Life, thus inspiring him with the gift of song. From the charming sweetness of his poetry, Háfiz was fondly styled by his admiring contemporaries *Chagarlab*, or Sugar-lip. His ghazals are, externally, all on sensuous subjects—wine, flowers, beautiful damsels, &c., and hence he is often termed by Europeans the Anacreon of Persia; but, while the common people, who have most of his verses by heart and constantly repeat them, regard them simply as love-songs, they yet possess an esoteric signification to the initiated, the objects of the physical world being employed to denote those which are visible only to the *inward* sight. That is to say, Háfiz, in common with nearly all the greater poets of Persia, was of the sect of Súfí philosophers, the mystics of Islám, who are altogether free from Mohammedan fanaticism, and 'claim to be in so intimate a communion with the Deity, through devotion and the cultivation of their higher and nobler feelings, that they can afford to rise superior to the petty details of dogma and superstition.' From the mystical element in his poems, Háfiz is also called *Lisán el-Ghayb* (the Voice of Mystery). But, apart from any esoteric signification, it has been well remarked that 'to ignore the fact that natural feelings and sentiments, the contemplation of natural beauty and the enjoyment of human, intellectual, and corporeal pleasures, suggested the various expressions of admiration, love, or wit which these poems contain, would be contrary to the dictates of common sense.' In short, the key to the interpretation of the songs of Háfiz is to be sought in a combination of materialism and súfiism.

Sir Gore Ouseley has remarked that the style of Háfiz 'is clear, unaffected, and harmonious, displaying at the same time great learning, matured science, and intimate knowledge of the hidden as well as the apparent nature of things; but, above all, a fascination of expression unequalled by any other [? Persian lyrical] poet.' The name of Háfiz is a household word throughout Persia, and his songs are cited in every social assembly, so that he who can most frequently quote from Háfiz a passage appropriate to the subject of conversation is held in the highest esteem and admiration. Indeed such reputation did his ghazals acquire that his *Díván*, or collection, was resorted to in order to gather from it *fatwas*, or decrees of fate and judicial decisions, in like manner as the *Sortes Virgilianæ* were practised in Europe during medieval times.

If we may credit popular tradition, at the death of Hafiz the 'rigidly orthodox' objected to the interment of his corpse with the customary ceremonies, because of the loose tone of many of his odes, and his alleged scepticism, if not rank infidelity. But some of his friends procured an appeal to the poet's *Divan*, which opened at a passage that set all doubts as to his orthodoxy at rest:

> Even though far away from the bier of Hafiz
> Ye may mourn, he cannot be a hardened sinner.
> Peace!

It is generally believed that Hafiz lived to a good old age, although the date of his birth is not recorded. His tomb, which is situated some two miles north-east of Shiraz, has been most magnificently adorned by princes and wealthy vazirs, and is visited by numerous pilgrims and others from all parts of Persia.

The odes of Hafiz were first collected by Kasim Anvari, after the poet's death. Many editions of the Persian text have been printed, among which the most important are the following: by Abu Salih Khan Ispahani at Calcutta (1791); by G. Jervis and others at Bombay (1828); an edition printed at Cawnpore (1834), and one at Bulak (1834), and again in 1840. A valuable edition of the text by Brockhaus, in 3 vols., was published at Leipzig (1854–61). Von Rosenzweig-Schwannau published at Vienna a German translation of the greater portion of the poems (3 vols. 1858–64). The earliest rendering of a selection of the ghazals of Hafiz was published at Vienna in 1771, in Latin by Reviczki, and from it Richardson chiefly translated his *Specimen of Persian Poetry, or Ten Odes of Hafiz* (1802). There are other English renderings of some of the odes by Nott (1787), Hindley (1800), Rousseau (1801), Sir William Ouseley (1797–98), Bicknell (1875), Love (1877), and S. R. [Robinson] (1879). In 1891 Lieutenant-colonel Wilberforce Clarke published a complete English prose rendering of the *Divan-i-Hafiz*, in 1881 Professor Palmer had contemplated an English metrical translation of the entire *Divan*. There are also German versions of some of the poems by Von Hammer (1813), Daumer (1846), and Nesselmann (1865).

Hag, one of the vernacular names for the *Myxine glutinosa L.*, one of the Cyclostomata or Round mouths, allied to the lamprey. It is common off the coasts of the north of England, Scotland, and Norway, and of the North Atlantic generally, living in muddy ground at a depth of 40 to 345 fathoms. The mouth is a hollow suctorial disc, furnished with a single tooth above and two rows of strong, pointed, horny teeth below. There is a single nasal aperture above the mouth, which communicates with the pharynx. Round the nostril and mouth are four pairs of short barbules or tentacles. The body is

Hag.

eel-shaped, with no lateral fins, but a slight median fin round the tail. There are no bones; the backbone is represented by a persistent notochord with a cartilaginous sheath; the skull and mouth skeleton are also cartilaginous. There are six gill pouches on each side, communicating internally by as many short tubes with the gullet, and externally giving off six longer tubes which unite and open by a single external aperture in each side of the body at some distance from the head. No eyes externally; mere rudiments internally. The intestine is straight. On each side of the ventral median line are a series of cutaneous glands which secrete large quantities of gelatinous slime. There are no genital ducts. The eggs are of very large size, and when expelled from the ovary are contained in a horny egg-membrane; their shape is an elongated ellipsoid, at each end of which are a number of fine knobbed processes of the horny case, by which the eggs become entangled together. In the young state the animals are hermaphrodite, and contain immature eggs and ripe milt; when older they produce eggs only. The fish is about 15 inches in length when adult, and of a livid red colour. There are no scales. The Myxine, when not feeding, lies buried in the mud, with only the single nostril protruded, and a respiratory current of water passes through this nostril to the gill-pouches, escaping again by the branchial aperture. These creatures are often caught in very large numbers on haddock-lines (long lines). They gorge the bait (mussels) down into their stomachs. They also attack fish (cod, haddock) hooked on the lines, and devour all the flesh, leaving the skin and skeleton. They probably attack living fish (Gadidæ) in the same way, but evidence on this point does not seem very certain. Three species are known—the North Atlantic one mentioned, another from Japan, and another from Magellan Strait. Bdellostoma, which is closely allied, has six or more separate external branchial openings on each side, and is larger. Two species are known; one is common at the Cape. Nansen, while he was still at Bergen, described the hagfish as a hermaphrodite 'in a transition stage,' for according to his researches the animal is a *male* until it attains a certain size, and thereafter a *female*, or in some cases a hermaphrodite.

Hagar. See Abraham.

Hagberry. See Bird-cherry.

Hagbut. See Firearms.

Hagedorn, Friedrich von, poet, was born 23d April 1708, at Hamburg, studied at Jena, and in 1733 became secretary to an old trading company at Hamburg called the 'English Court.' He died 28th October 1754. His poetry consists mainly of light satire, narrative, and 'society' verses. Since 1756 there have been many collected editions of his poems (as in 1825, 5 vols.). See works by Schuster (1883) and Eigenbrodt (1884).

Hagen, an industrial town of Prussia, in the Ruhr coal district of Westphalia, 12 miles NE. of Elberfeld-Barmen. It carries on a great deal of puddling and iron-founding, and has manufactures of iron, steel, and tin goods, cotton, cloth, leather, paper, beer, and tobacco. Pop. (1875) 24,290; (1885) 29,611; (1895) 41,833.

Hagenau, a town of Alsace-Lorraine, situated in the Hagenau forest, on the Moder, 21 miles by rail N. by E. of Strasburg, manufactures porcelain stoves, and has cotton and woollen spinning. The chief trade is in hops and wine. The Romanesque church of St George dates from the 12th century, and the Gothic church of Nicholas from the 13th. Having been invested with town rights by Frederick Barbarossa in 1164, it was made a free imperial city in 1257. By the treaty of Westphalia (1648) it was given up to France, and in 1871 finally returned to Germany. Pop. (1875) 11,726; (1885) 13,460.

Hagenbach, Karl Rudolf, theologian, was born 4th March 1801, at Basel. While at the universities of Bonn and Berlin, where he studied theology, he was principally influenced by Schleiermacher and Neander; and on his return to Basel he received a fresh impulse from his intercourse with De Wette. From 1824 he occupied a chair of Theology in his native town, and died there, 7th June 1874. The subjects he taught were the history of dogma and of the church; in respect of

this latter he wrote and taught as an adherent of the 'mediation' school of German theology. His numerous books on church history were issued as one uniform work, *Kirchengeschichte von der ältesten Zeit bis zum 19 Jahrhundert* (7 vols. 1868–72; 2d ed. 1885 *sq.*). Besides this he also wrote *Lehrbuch der Dogmengeschichte* (2 vols. 1840; Eng. trans.); *Encyklopadie und Methodologie der theologischen Wissenschaften*, one of the most useful manuals for the student of German theology, which in 1884 reached an 11th edition (by Kautsch); nine vols. of *Sermons*; biographies of Œcolampadius and Myconius (1859); a memorial of De Wette (1850); *Religionsunterricht an höheren Gymnasien* (6th ed. 1881); *Die theologische Schule Basels* (1860); and also two small volumes of poetry.

Hagerstown, capital of Washington county, Maryland, on Antietam Creek, 85 miles WNW. of Baltimore by rail. It has machine-shops, flour-mills, and manufactories of furniture and other wooden wares, fertilisers, farming implements, and cigars. Pop. (1890) 10,118.

Haggada. See EXEGESIS, TALMUD.

Haggai (Heb., 'born on a festival'), one of the minor prophets of the Old Testament. He was among those who returned from the Babylonian exile with Zerubbabel and Joshua. The building of the temple begun by them had for some time been at a stand-still, and several years of scarcity had followed. In the second year of Darius (520) Haggai prophesied that the dearth was due to the divine displeasure with the settlers for adorning their own houses while the house of God remained unfinished. The personal history of Haggai beyond what is given in his book is unknown. His prophecy is entirely connected with the construction of the temple, and closes with a promise to Zerubbabel, in whom he appears to have expected the fulfilment of the promises of the prophets regarding the ideal son of David. His style is monotonous and weak, which some have ascribed to the pressure of troublous times, others to his advanced age, concluding from ii. 3 that he was among those who seventy years before were carried into exile and had seen the old temple. There are commentaries by Hitzig (3d ed. 1863; 4th ed. by Steiner, 1881), Ewald (1867; in vol. v. of Eng. trans. of his *Prophets*, 1878), Keil (2d ed. 1873), Reinke (1868), and Van Eaton (Lectures, ed. by Robinson, Pittsburg, 1883).

Haggard, HENRY RIDER, novelist, was born of a good Norfolk family at Bradenham Hall, June 22, 1856, and was educated at Ipswich grammar-school. He went out to Natal in 1875 as secretary to Sir Henry Bulwer, and next year accompanied Sir Theophilus Shepstone to the Transvaal, where he served until 1879, when he returned to England to marry and settle down to a literary life. His first book, *Cetewayo and his White Neighbours* (1882), pleased the Cape politicians, but attracted no attention elsewhere. It was in a new kind of fiction that he was to make his successes. However, his *Dawn* (1884) and *The Witch's Head* (1885) were only successful after the immediate, extraordinary, and not undeserved popularity of *King Solomon's Mines* (1885). This was too quickly followed by *She* (1887), *Jess* (1887), *Allan Quatermain* (1887), *Maiwa's Revenge* (1888), *Mr Meeson's Will* (1888), *Cleopatra* (1889), *Allan's Wife* (1890), *Nada the Lily*, *Eric*, *Montezuma's Daughter*, *Joan Haste*, &c. Haggard has fertile invention, vigour, and novelty enough, but not the rare faculty of making things seem true; while his style is crude and lacks in distinction, his grasp of character is feeble. His fights indeed are powerful but not Homeric, and reek with needless blood and artificial gruesomeness; his pages are bright with vivid but somewhat garish African colours. His chief merit is his readableness; his greatest praise his phenomenal success; for with all his gifts he is still but little of the artist, and hardly to be taken seriously as a novelist.

Haggis, a Scotch dish, called by Burns the 'great chieftain o' the puddin' race,' is usually made with the large stomach-bag of a sheep, also one of the smaller bags called the king's hood, together with the lights, the liver, and the heart. After the stomach-bags have been well cleansed, the small bag is boiled along with the pluck. A quarter of the liver is now grated down, and the heart, lights, and small bag are minced very fine along with a large onion and enough beef-suet to moisten the meal. Two small teacupfuls of oatmeal previously crisped before the fire are added, with salt, and black and Jamaica pepper. The whole is now stirred together, and put in the large bag, which, however, must not be much more than half filled; it is sewed up, and afterwards boiled for about three hours.

Hagiographa. See BIBLE.

Hagiology. See SAINT.

Hague, THE (Dutch *'s Gravenhage*, 'the count's hedge'), the capital of the Netherlands, and the residence of the court, stands 2 miles from the North Sea and 15 NNW. of Rotterdam. It is one of the handsomest cities in the country, being intersected by canals and shady avenues of lime-trees, and having many fine public buildings and private houses. In the centre of the city is the Vijver, or Fish-pond, to the south of which stands the old castle of the counts of Holland. It consists of two courts, an outer and an inner; in this latter are the 13th-century Gothic knight's hall and the chambers in which the Dutch parliament holds its sittings. On one side of the outer court (*Buitenhof*) stands the gate-tower, which was formerly used as a state-prison, and in which the brothers De Witt were confined till dragged thence and torn to pieces by the populace (1672). The most noteworthy amongst the public buildings and institutions of the place are the picture-gallery, with a splendid collection of works by native painters (Paul Potter's 'Bull' and Rembrandt's 'Lesson in Anatomy'); the royal library, with 200,000 volumes, 4000 MSS., and collections of coins and gems; the municipal museum, with several Dutch pictures; the Museum Meermanno-Westreenen, containing a collection of early printed books; the ethnographic museum, rich in Chinese and Japanese objects; the town-house; and the royal palaces. The church of St James is the most important ecclesiastical edifice; it dates from the 14th century, and is Gothic in style. The Hague is the seat of several learned societies, as the Indian Society and the Institute for the Language, Land, and People of the Dutch Indies. Amongst the numerous statues that adorn the city are those of William I. (two in number), William II., Spinoza, Bernhard of Saxe-Weimar, and the monument which commemorates the deliverance from the French. Close to the town is the beautiful pleasure-park called 'The Wood,' in which stands a royal residence (1647) with the magnificent so-called 'Orange Hall.' Ryswick, where the treaty of 1697 was signed, is in the immediate vicinity. The Hague is connected by beautiful roads with Scheveningen, a fashionable bathing-place on the coast of the North Sea, which is incorporated municipally with The Hague. The city owes its importance mainly to the fact that it is the residence of the court and the capital of the country; but it has also considerable manufacturing industry, as iron-founding, copper and lead smelting, cannon-founding, printing, furniture and

carriage making, and the manufacture of gold and silver lace. Pop. 1875, 109,254; (1891) 165,560. From 1250 a hunting lodge of the Counts of Holland. The Hague did not acquire importance until the 16th century; in 1527 it became the seat of the supreme court in Holland, in 1584 the place of assembly of the States of Holland and of the States-general; and it was also the residence of the stadtholders. There, too, numerous treaties have been signed and diplomatic conferences held, especially the Triple Alliance of 1668 and that of 1717.

Hahnemann, CHRISTIAN FRIEDRICH SAMUEL, the founder of the homœopathic method of treatment (see HOMŒOPATHY), was born at Meissen, in Saxony, April 10, 1755. Educated at the grammar school of Meissen, he entered the university of Leipzig at the age of twenty; and it was by teaching and translating books written in English, French, Italian, Latin, Greek, Hebrew, and Arabic that he supported himself while at the university. The reputation he had made for himself as a scholar while at Meissen procured for him a free admission to the university classes. From Leipzig he proceeded to Vienna for clinical study, where he was the favourite pupil of Von Quarin, physician to the Emperor Joseph. He then passed two years as physician and librarian to a nobleman residing in Transylvania, after which he entered and, in 1779, graduated at the university of Erlangen. During the following ten years he practised medicine and held several public appointments in Dresden and elsewhere, and then settled in a small village near Leipzig. His observation and practice had so fully convinced him, not only of the uselessness, but also of the injurious character of the prevailing methods of treatment, that he now abandoned all practice and devoted himself to chemical research and the translation into German of foreign scientific books. Of these, Cullen's *Materia Medica* was one. Feeling dissatisfied with his author's explanation of the *modus operandi* of bark in curing ague, it occurred to him to endeavour to find out what kind of action this drug had on persons in health. He accordingly took considerable doses of bark himself, when he observed that they caused some of the symptoms he had noted as being characteristic of ague in Transylvania. This experiment led to his interpreting the curative power of bark in this fever by the hypothesis that it 'overpowers and suppresses the intermittent fever by exciting a fever of its own of short duration.' This appears in one of his notes in his translation of Cullen. Thus, as Ameke remarks, 'he started with the idea of aiding the recuperative power by a medicinal excitant acting directly on the part affected.'

His experiment also convinced him that it was by ascertaining the effects a drug produced on healthy persons that its mode of action could most surely be ascertained. He therefore commenced a research into the records of medicine, examining the reports of cases of poisoning by individual drugs, and made experiments with other drugs upon himself and his friends. He then studied all the cases of cure by these same drugs that he could find. In these investigations he occupied six years. They proved to him that, whatever might be the truth of the theory the bark experiment had suggested, the fact was that in all instances the medicine which had cured produced a very similar condition in healthy persons to that it had relieved. This conclusion he published in an essay in *Hufeland's Journal* in 1796, having the title of 'A New Principle for ascertaining the Curative Properties of Drugs.' It is in this essay that the principle or rule of *similia similibus curantur* is first put forward by him, not as a theory but as a fact. His views at once met with vehement opposition. His denunciation of blood-letting and other violent modes of treatment aroused the animosity of physicians, while the very small doses of medicine which alone were needed according to his new method, provoked the apothecaries, whose trade interests were threatened. They refused to dispense his prescriptions, and he accordingly gave his medicines to his patients without any charge. For a physician to dispense his own medicine was an infringement of the rights and privileges which German law had conferred upon the apothecaries, and hence he was prosecuted in every town in which he attempted to settle from 1798 until 1810, when he returned to Leipzig. Two years afterwards he was appointed a *privat docent* or extra-academical lecturer of the university. The thesis he defended before the Faculty, when a candidate for this position, has been described as 'remarkable for its display of extensive reading in the ancient authors, and not only those more immediately connected with his own professional pursuits, but also in the classical writers of antiquity.' At Leipzig he remained, teaching and developing his system of medicine to an ever-increasing band of enthusiastic disciples, and practising his profession uninfluenced by constantly recurring attacks from his professional neighbours until 1821, when a successful prosecution by the apothecaries for dispensing his own medicines drove him out of Leipzig. Under the protection of the Duke of Anhalt-Köthen he retired to Köthen, where he became a centre of attraction to numerous invalids in all parts of the world. His wife dying in 1831, in 1835 he married a French lady, who induced him to remove to Paris, where he resided and practised until his death, 2d July 1843.

Hahnemann is also known as one of the earliest advocates of hygiene. His book entitled *The Friend of Health*, published in 1792, proves him to have been very far in advance of his time on what is now called preventive medicine. Equally so was he in the treatment of the insane. His account of his successful treatment of a certain Hanoverian statesman, who, becoming maniacal, was placed under his care, shows that in 1794 he had adopted those principles of non-restraint and kindness in dealing with the insane which in later years were advocated by Pinel in Paris and Conolly in England. He was also the author of several valuable papers on chemistry in Crell's *Annalen der Chimie*—the first German periodical devoted to that science. A statue of Hahnemann was erected in Leipzig in 1851. See his Life by Albrecht (2d ed. Leip. 1875).

Hahn-Hahn, IDA, COUNTESS, authoress of a great number of German romances dealing with aristocratic circles of life, conventional in style and often sentimental in feeling, and of numerous books of travel, was born at Tressow, in Mecklenburg-Schwerin, 22d June 1805. At the age of twenty-one she married a relative; but the union was dissolved three years later. She thereupon travelled much in Europe and the East. In 1850, weary of her restless life, she embraced Roman Catholicism, and in 1852 entered a convent at Angers. Her later writings are strongly marked by ultramontane views. The best known of her novels are *Gräfin Faustine*, *Ulrich*, and *Clelia Conti*. Her style was cleverly satirised in Fanny Lewald's *Diogena* (1847). A collection of her early romances in 21 vols. appeared at Berlin in 1851. She died at Mainz, 12th January 1880.

Haidarabad. See HYDERABAD.

Haiduk, or HAJDUK (from a Hungarian word meaning 'drover,' 'cowherd'), the name given in Hungary to those who in the 16th century maintained a guerilla warfare against the Turks, from

the forests of eastern Hungary. In 1605 Stephen Boeskay, prince of Transylvania, established them in a district which he set apart for their occupation, on the left bank of the Theiss, gave them an independent constitution, and conferred upon them the privileges of hereditary nobility. This favoured position they retained until the conclusion of the war of 1849. The Haiduks are engaged almost exclusively in agriculture. In 1876 their country was incorporated in the county of Hajdu, with Debreczin as capital. The name was formerly borne by the Hungarian infantry of the line; and in the 18th century it was also applied to the retainers of the Hungarian magnates.

Haifa, a seaport of Syria, situated at the foot of Mount Carmel, a place of some 6000 inhabitants. A little distance to the north-west a settlement of the Würtemberg 'Society of the Temple' was founded in 1869, who now form a flourishing agricultural colony of 300 persons, chiefly engaged in cultivating the vine and growing fruits. Grain is exported. Gordon Pasha paid visits to Haifa, and here Laurence Oliphant settled in 1882. See his *Haifa, or Life in Modern Palestine* (1887). A railway from Haifa and Acre (on the other side of the bay) to Damascus was begun in 1892.

Haik. See ARMENIA.

Hail, Hailstorm. The word hail in English is used to denote two phenomena of quite different origin and formation. These have in recent years been distinguished as hard hail, or true hail; and soft hail, which denotes the fine, light grains, like small shot, that frequently fall in winter, much more rarely in summer, and are generally a precursor of snow. Soft hail is the *grésil* of the French, and the *graupel* of the Germans. The theory of the formation of soft hail has yet to be formulated. True hail is round, hard, compact, and formed of either clear or granular ice, the hailstones being often found when broken across to be composed of alternate layers of these two states of ice. It has a well-marked diurnal period, 80 per cent. of the whole number of hailstorms occurring in the six hours from 10 A.M. to 4 P.M., and only 8 per cent. in the fourteen hours from 6 P.M. to 8 A.M. The essential point to be noted in the diurnal period of hail is that the maximum period of hailstorms is two hours earlier than the maximum period of Thunderstorms (q.v.). The maximum period for thunderstorms is when the ascending current from the heated surface of the earth is at its greatest strength for the day; but the maximum period for hail occurs two hours before the ascending current has fully established itself, or it occurs at the time when atmospheric temperature and vapour diminish with the height at a much greater rate than the normal. In the higher latitudes the fall of hail may be regarded as restricted to the warmer months of the year; in countries where the summer is practically rainless no hail falls; and where the rainfall is small and at rare intervals very few cases of hail occur.

Hail is connected with whirlwinds, more or less developed; and it is when the hailstorm is an attendant on a tornado or on a great thunderstorm that it assumes its most destructive form, carrying devastation through a narrow belt of land usually of considerable length.

The theory of the formation of hail has been given by Ferrel in his *Meteorological Researches for the Use of the Coast Pilot*, part ii. p. 85. The vapour carried upwards by the vortical gyrations of the tornado is, below a certain height, condensed into cloud and rain; but above that height into snow. Now when the raindrops formed below are carried higher up into the cold snow regions by the powerful ascending currents of the tornado, and are kept suspended there a little while, they become frozen into clear hard hail. If these hailstones be now thrown quite outside the gyrations of the tornado, they fall to the earth as a shower of compact homogeneous hailstones of clear ice of ordinary size. But should they be caught in the descent and carried in towards the vortex by the inflowing aerial current on all sides, they are again rapidly carried aloft into the freezing region. A number of such revolutions of ascent and descent may be made before they ultimately fall to the earth. While high up in the snow region the hailstones receive a coating of snow; but while in the region lower down, where rain, yet unfrozen, is carried up, they receive a coating of solid ice. In this way alternate coatings of ice and snow are received, and the number of each sort indicates the number of ascents and descents performed before the hailstone falls to the ground. When the nucleus is compact snow, as it usually is, the hailstone has its origin high up in the snow region as a small ball of snow or soft hail.

From a well-known property of ice (regelation), the impinging hailstones are frequently frozen together not only in their course through the air, but also at the surface of the earth, giving rise occasionally to hailstones of larger dimensions. A curious instance of the fall of large hail, or rather ice-masses, occurred on one of Her Majesty's ships off the Cape in January 1860, when the stones were the size of half-bricks, and beat several of the crew off the rigging, doing serious injury. More than once in the summer of 1889 hailstones proved unusually destructive on the continent of Europe; in Moravia, for instance, where many stones fell as big as a man's fist, and weighing 3 lb., a number of people were killed in the fields, and many more were injured.

A description (taken from *Mém. de l'Acad. des Sciences*, 1790) of a most disastrous hailstorm may be here added. This storm passed over parts of Holland and France in July 1788. It travelled *simultaneously* along two lines nearly parallel—the eastern one had a breadth of from half a league to five leagues, the western of from three to five leagues. The space between was visited only by heavy rain; its breadth varied from three to five and a half leagues. At the outer border of each there was also heavy rain, but we are not told how far it extended. The general direction of the storm was from south-west to north-east. The length was at least a hundred leagues, probably two hundred. It seems to have originated near the Pyrenees, and to have travelled at a mean rate of about 16½ leagues per hour towards the Baltic, where it was lost sight of. The hail only fell for about seven and a half minutes at any one place, and the heaviest hailstones weighed about 9 ounces. This storm devastated 1039 parishes in France alone, doing damage to the extent of nearly a million of English money.

Hailes, LORD, the judicial title of Sir David Dalrymple, a well-known historical antiquary, born at Edinburgh, 28th October 1726. He was the grandson of Sir David Dalrymple, youngest and reputedly the ablest son of the first Viscount Stair. He was educated at Eton and Utrecht, whence he returned to Scotland in 1746, to be called to the Scottish bar two years later. Here his success was highly respectable, but not astonishing, as his extensive learning, sound judgment, and great industry were marred by indifferent oratory. In 1766 he was appointed one of the judges of the Court of Session, and assumed the title by which he is chiefly known to posterity. In this office his accuracy, diligence, judicial impartiality, and dignified demeanour secured him the highest respect, and ten years later he was made a justiciary lord. At his country-seat of New Hailes, five

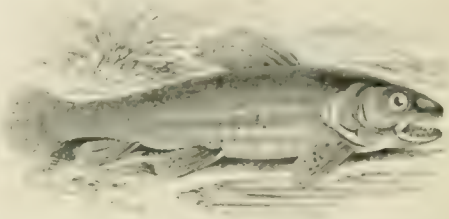
miles from Edinburgh, he gave his leisure to uninterrupted literary activity, on behalf of religion and in elucidation of early Scottish history. And though his official duties were arduous, he found time to compose numerous works, surpassing in value those of many men whose lives have been wholly devoted to literature. He was much esteemed by Dr Johnson, and corresponded with some of the greatest men of his time. He died 29th November 1792. His funeral sermon was preached by 'Jupiter' Carlyle; his appearance remains to us in a characteristic portrait by Kay.

Among his books are *Select Discourses, by John Smith of Cambridge* (1756); *A Discourse on the Grecian Constitution* (1757); *Memorials and Letters relating to the History of Britain in the Reign of James I.* (1762), a curious and interesting volume; *The Works of the ever-memorable Mr John Hales of Eton*, 3 vols. 1765; *Memorials and Letters relating to the History of Britain in the Reign of Charles I.* (1766); *Annals of Scotland from the Accession of Malcolm III., surnamed Canmore, to the Accession of Robert I.* 1776); and *Annals of Scotland from the Accession of Robert I., surnamed the Bruce, to the Accession of the House of Stuart* (1779). The last two form one continuous matter of fact history of the greatest possible value, which Dr Johnson valued above the 'painted histories more to the taste of our age.' Besides these, Dalrymple wrote works on legal antiquities and ancient church history, edited old Scotch poems, and published sketches of the lives of various notable Scotchmen, as specimens of how a *Biographia Scotica* might be executed.

Haileybury College. 2 miles SE. of Hertford, erected in 1809 by the East India Company from the design of William Wilkins, R.A., as a place of training for cadets in their service, and so occupied until the transference in 1858 of the powers of the Company to the crown. An interval then ensued during which the college remained absolutely empty, though the solitude was for a few months broken by the arrival of a regiment from India, fresh from the mutiny; but the building was not suited for barracks, and it was soon again deserted. For a while there was a talk of converting it into a workhouse, but happily a better fate was in store for the place: the enterprise of several county gentlemen successfully carried through a scheme for establishing at Haileybury a new public school, and in September 1862 the school was opened, its numbers being limited under its charter to 500. Five exhibitions of from £60 to £20, tenable for three years at Oxford or Cambridge, and in some cases elsewhere, are open yearly for competition to members of the school who are under nineteen years of age; another of £50 is available every third year, and there are nine scholarships for boys at the school. Among the professors on the staff of the East India Company were Malthus, the political economist; Sir James Mackintosh, the philosophical historian; William Empson, editor of the *Edinburgh Review*; and Sir Monier Monier Williams, Boden Sanscrit professor at Oxford; and among the students who afterwards became illustrious, John Lawrence, ruler of the Punjab in the time of the Indian Mutiny, afterwards Lord Lawrence, Viceroy of India; Sir Charles Trevelyan; Bishop Forbes; and Sir Henry Bartle Edward Frere. See Higgen, *Old and New Haileybury* (1887), and Monier Williams, *Reminiscences of Old Haileybury College* (1894).

Hail, Mary. See Ave Maria.

Haimura (*Erythrinus macrodon*), a large freshwater fish of Guiana, belonging to a small group of fishes (Erythrinina), family Characinidæ (Günther). It measures from 3½ to 4 feet in length; its flesh is firm, and well flavoured; and at times the fish is so abundant that it forms the principal article of food with the Indians, who capture it by hook or in an ingeniously contrived trap. It is very voracious. The jaws are very powerful, and the teeth are large and can inflict serious wounds: a man's hand has



Haimura.

been cut off by them. The haimura particularly abounds near rapids and falls in the upper parts of the rivers of Guiana.

Hainan, an island of China, the southernmost land of the empire, lying between the Gulf of Tong king and the China Sea, and 15 miles S. from the mainland. It forms part of the province of Kwangtung, and measures about 150 miles (from south-west to north-east) by 100. The centre and south of the island are mountainous; on the north the mountains are fringed with fertile plains, well watered by rivers. The island, which is purely agricultural, produces rice, sesamum-seeds, ground-nuts, sugar, sweet potatoes, taro, cocoa-nuts, indigo, beans, turnips, millet, pine-apples, and various kinds of vegetables. Exports—pigs, sugar, sesamum-seeds, ground-nut cakes, betel-nuts, and eggs; annual value, £316,450. Imports—opium, cotton and woollen goods, and rice; annual value, £410,000. The capital is Kiung-chow (pop. 40,000), the port of which, Hoi-how (15,000), 3 miles distant, has been open to foreign trade since 1876. The inhabitants number altogether about two and a half millions, the plains being inhabited by Chinese (1½ millions), the mountainous and unknown interior by the aboriginal Les. Eight to ten thousand Chinese emigrants leave Kiung-chow every year for Singapore and Bangkok. Plants and animals, especially birds and fishes, are numerous. Gold exists. The island is subject to frequent earthquakes, and in summer to typhoons. See B. C. Henry's *Ling-Nam* (1886).

Hainault (formerly spelt in a perplexing variety of ways from *Haysneaultx* to *Héno*; Ger. *Hennegau*), a southern province of Belgium. Area, 1437 sq. m.; pop. (1894) 1,082,494, principally Walloons. The surface consists in the north and west of flat and fruitful plains; the south is occupied by spurs of the Forest of Ardennes. The principal rivers are the Haine—from which the province has its name—the Scheldt, the Dender, and the Sambre, the last a tributary of the Meuse. The soil is highly productive; wheat and flax are very extensively grown. Valuable crops of fruit, vegetables, and beet are produced. Excellent breeds of horses, horned cattle, and sheep are reared. Toward the south and south-east, in the neighbourhood of Mons and Charleroi, are very extensive coalfields, from which about 2,000,000 tons of coal are annually extracted. Iron is also produced in considerable quantity, and marble, building-stone, and limestone are quarried. Linen, porcelain, iron and steel goods, lace, paper, leather, &c., are extensively manufactured. The capital is Mons. From the 9th century Hainault was the name of a countship, which embraced the modern districts of both French and Belgian Hainault. For many years (1030–1279) the history of the countship was closely connected with that of Flanders (q.v.). From 1345 to 1433 it belonged to the royal house of Bavaria, and then passed to Burgundy, the fortunes

of which duchy it shared down to the French Revolution. French Hainault (now the department of Nord) was, however, formed out of the county after the treaty of the Pyrenees (1659). The present Belgian province was constituted in 1815. For Hainault Forest, see EPPING.

Hainburg, a walled town of Austria, on the Danube, 27 miles ESE. of Vienna, with a royal tobacco factory. It is usually identified with the ancient *Carnuntum* (q.v.); and a Roman aqueduct still supplies its market-place with water. In the *Nibelungenlied* the castle of Hainburg is called Heimburc, the border fortress of the country of the Huns. It was taken from the Hungarians in 1042 by the Emperor Henry III., and afterwards became a residence of the Austrian princes. In 1482 it was stormed by Matthew Corvinus, in 1683 by the Turks; and in 1827 it was burned to the ground. Pop. 4857.

Hainichen, a town of Saxony, the centre of the German flannel manufacture, lies 13 miles NE. of Chemnitz. Besides its staple product, it also manufactures cloth, leather, chenille, and plush. Here Gellert was born in 1715. Pop. 8253.

Hair. With the exception of the palms of the hands and the soles of the feet, the human skin is almost everywhere studded over with hairs. In few localities, however, does the hair attain any degree of thickness or length. Except on the scalp, the male cheeks, &c., the hairs are fine, short, and scanty, but more apparent in the male than the female.

An individual hair may be regarded as consisting of a root, a shaft, and a point. The *root* is the short, soft bulbous portion which is withdrawn from the skin when a hair is plucked from the body; the *shaft* is the part which projects beyond the surface of the integument; and the *point* is its attenuated free extremity.

The root of the hair is enclosed within a minute tubular depression in the skin which is termed the *hair-follicle.* This is the chamber in which the hair is manufactured, and it is here also that additions are made to its root so that it increases in length. The skin is composed of two layers: an outer epidermis and an inner corium. The epidermis is the cellular protective layer, and the hair and nails may be regarded as outgrowths from it. Amongst the lower animals the claws, hoofs, spines, feathers, scales, &c. all belong to the same category—all, like the hair, are appendages of the epidermal layer of the skin. The corium is fibrous and vascular, and rests directly upon the fatty subcutaneous tissue of the body. Both layers of the skin take part in the formation of the hair-follicle. Its wall, therefore, has two distinct layers entering into its formation—the inner layer being cellular and epidermic, whilst the outer layer is fibrous and continuous with the corium. When a hair is wrenched out of its socket the inner layer of the follicle adheres to the root, and is in great part withdrawn with it. It is therefore termed the *root-sheath.* In the case of the short hairs the hair-follicles do not sink beyond the skin, but in the case of the head-hairs and beard they are much deeper, and penetrate into the subcutaneous fatty tissue.

The extremity of a fresh hair-root is expanded in the form of a knob, called the *hair-bulb.* This hair-bulb is composed of cells like those of the root-sheath, and at the bottom of the follicle the two are directly continuous with each other around the circumference of the bulb. Again, at the bottom of the hair-follicle there is a little fungiform projection continuous with the corium. It is called the *hair-papilla,* and is plentifully supplied with both blood-vessels and nerves. This papilla is of the utmost importance in connection with the process of hair-growth. It is also an agent in fixing the hair in its follicle, because the lower aspect of the hair-bulb is hollowed out into a cavity, and the papilla is received into this in the same manner as a head is received into a cap.

In structure a hair may be considered as being composed of three distinct parts. Its chief bulk consists of *fibrous substance;* this is coated on the outside by a thin scaly layer, termed the *hair-cuticle,* whilst its centre is traversed by a narrow cellular thread or core, which is termed the *medulla.* The hair-cuticle is exceedingly thin, and is formed by a single layer of minute flat scales deposited upon the surface of the hair. These scales overlap each other in an upward direction from the root to the point of the hair. The free uncovered margins of the cuticular scales therefore look upwards towards the point, and when examined under the microscope they appear on the surface of the hair in the form of wavy lines, and at the same time give to its outline a slightly toothed or serrated appearance. It is the arrangement of these scales which gives to hair its commercial value. It is due to them that the *felting* of hair is possible. But human hair is ill adapted for this purpose, because the cuticular scales are closely applied to the body of the hair. In wool, however, the scales stand well out, and the serrations are so distinct that the hairs interlock firmly the one with the other.

Fig. 1.
Vertical section of Skin, showing hair-follicle:
a, epidermis; *b*, hair; *c*, hair-bulb; *d*, *d*, oil-glands; *e*, fat-cells.

We have mentioned that the hair-root is attached to its follicle (1) by a continuity at the bottom of the follicle of the cells composing the hair-bulb and those forming the root-sheath, and (2) by the hair-bulb being moulded over the surface of the fungi-form hair-papilla. There is yet a third connection. The follicle is lined by delicate imbricated scales, which are directed downwards and interlock with the upwardly-directed scales which coat the hair-root.

The *fibrous substance* of the hair is composed of flattened fibres applied to each other in the longitudinal direction, and firmly united by intervening cement-substance. These fibres can be still further resolved into minute flattened elongated plates or cells, which constitute the ultimate elements of the fibrous substance. The pigment or colouring matter of the hair is distributed throughout the fibrous substance. It is partly placed within the cells which build up the fibres, and partly in the cement-substance which glues the cells together. But the colour of a hair is not entirely determined by the quantity or kind of pigment present. It is also to a certain extent determined by the presence of air which is contained in minute chinks or crannies in the fibrous substance. These air-spaces are numerous in white hairs, but are almost entirely absent in black hairs.

Fig. 2.
Surface of a human Hair, magnified.

The *central medulla* is not present in every hair, nor, indeed, is it to be found throughout the entire length of those hairs in which it exists. Thus it is absent in the fine short hairs of the body, and also

in a large proportion of the hairs of the scalp. In structure it consists of two or three rows of rectangular cells, which contain a certain amount of air.

The structure of human hair is such that it can almost always be distinguished from hair drawn from other sources. At the same time it should be noted that the hair of certain of the anthropoid apes, more especially the Chimpanzee and Gorilla, resembles it so closely, both in structure and in microscopical appearance, that the differentiation would be matter of extreme difficulty—if indeed it were possible. Waldeyer, in his *Atlas der Menschlichen und Thierischen Haare*, 1884, gives a series of beautiful illustrations in which the hair of man may be compared with that of certain of the lower animals.

In connection with each hair there is a remarkable contrivance by means of which it is kept smooth, glossy, and pliant. It is furnished with two or more oil glands, which secrete a greasy fluid. Each of these glands consists of a little sacculated pouch which opens into the hair-follicle near its orifice by a short duct or channel of exit. The oily matter which is formed in the gland is discharged into the hair-follicle, and thus upon the surface of the hair.

Hairs are likewise provided with minute muscles. These consist of slender bands of contractile tissue, which cross the obtuse angle which is formed by the hair-follicle and the surface of the skin. On the one hand this little muscle is attached to the superficial part of the true skin, and on the other to the lower end of the hair-follicle. They are not under the control of the will, but cold and certain emotions, such as horror and fear, will bring them into play. In such cases the hair-muscles contract; they straighten the hair-follicles and erect the hairs. The condition known as 'goose-skin' is the result.

The hair-follicle is the laboratory in which the manufacture and continued growth of the hair is effected. At the bottom of the follicle is the little papilla upon which the hair-bulb is moulded. The blood-vessels of the papilla supply the material necessary for the growth of the hair. Additions are made to its base, and as it rises up in the follicle its upwardly-directed scaly covering sweeps before it the scales lining the follicle. The scales which are thus carried to the surface constitute a part of the scurf of the head. The rate at which the hair grows differs very much in different parts of the body, and it is also said to be affected by the age of the individual, the age of the particular hair under investigation, the season of the year, and even the hour of the day. The average growth of the beard has been computed to be 6½ inches each year. In the growth of the head-hair the greatest discrepancies exist in the results obtained by different observers. In young females who have lost their hair by fevers it has been noticed to grow at the rate of 7 inches each year.

When the growth is good the average length of hair on the female head will be found to vary from 22 to 28 inches. Anything beyond this must be regarded as exceptional. Cases, it is true, are recorded in which it has measured from 5 to 6 feet; but these are very rare. In the 'Hair Court' of the 1862 international exhibition there was a specimen of jet-black hair measuring 74 inches. But most extraordinary instances are recorded of the power of hair-growth possessed by certain of the North American Indians. A chief of the Crow tribe is mentioned by Catlin as having hair of the almost incredible length of 10 feet 7 inches.

The duration of hair-life is limited, and sooner or later it is shed. Indeed it is stated that the hairs of an infant are completely shed within a year after birth; those on the body and limbs go first, whilst the hairs of the head and the eyelashes follow. This change is carried on almost imperceptibly, seeing that the place of the falling hairs is taken by a second crop. The process of loss and renewal is very simple. The old hair is detached from the papilla, and soon another hair makes its appearance at the bottom of the same follicle, and grows towards its orifice. The detached hair is thus thrust out and shed. The whole process is not unlike the replacement of the milk teeth in the child by the permanent teeth. The second crop of hair which appears is perennial. An eyelash has been calculated to remain attached for 110 days. A head-hair has a longer period of life. It lives from two to four years. Before it dies provision is made for its successor, and so the process of shedding and renewal goes on continually. During its life a hair is only capable of growing a certain determinate length. The circumstance which determines this length is the amount of nutritive material which can be drawn from the blood-vessels of the papilla. Thus when a hair has attained its full length it will resume growth for a second time on being cut short. It is only when the loss exceeds the powers of renewal that a tendency to baldness results. In the case of the female head the daily loss may contain a quarter of the hairs shed of a length under 6 inches without giving rise to apprehension. Should the number of fallen short hairs exceed this proportion the hair-loss is abnormal, and baldness is likely to ensue.

As age advances the hair becomes gray. This is a natural and physiological process; but it may be hastened by severe trouble or other causes. In many cases the premature blanching of the hair is hereditary. When the change is taking place party-coloured hairs may be frequently found; of these it is the basal portion which is white, while the terminal part retains its colour. Brown-Séquard made some interesting experiments on his own beard whilst it was turning gray. He marked certain of the coloured hairs, and kept a constant watch on them. He states that in some cases an entire hair would turn gray in the course of a night. Two factors would seem to be at work in producing this condition of hair—viz. a loss of the power to produce pigment, and an increase of air in the shaft of the hair. Sometimes the change occurs rapidly—in the course, perhaps, of a few hours. Well-authenticated cases of this are on record. It is said that the auburn hair of Marie Antoinette turned gray in a single night. Surgeon Parry asserts that he actually saw the jet-black hair of a rebel sepoy whilst under examination and the fear of a horrible death turn gray in the course of half an hour. Baron Alphonse de Rothschild during the Commune is another instance. It is difficult to give any reasonable explanation of these sudden cases of hair-blanching.

The hair is regarded by anthropologists as being of high importance as a race character. Although there is no one special colour of hair peculiar to any one race, this character must not be disregarded. In our own country we may see every hue from the fairest flaxen to the blackest jet. Without doubt this points to a diversity of origin. Independently of colour, however, there are characters present in the hair which separate many of the races of man widely from each other. In the American Indians, Chinese, Japanese, and natives of High Asia the hair is long, straight, and harsh like a horse's mane. Amongst the negroes, Hottentots, and Papuans it is crisp and woolly. Between these extremes we may place the European, in whom the hair is wavy and flowing. The close curling of the negroes' hair has been shown by several observers to be largely due to the fact that the hair-follicles are curved. A spiral twist is thus given to the hair. It has been held that the straight harsh hair of

the American Indian is circular in transverse section, that the wavy European hair is oval, and that the crisp woolly negro hair is flattened and tape-like in cross-section. There now appears to be reason to doubt this (see Waldeyer's *Atlas*).

The chief use of the hair, and particularly of the fur of various mammals which is especially developed in the winter, is to protect the body from external cold. Except on the scalp and on the throat, this cannot be considered as applying to man. What, then, are the uses of the hair on the face, and especially on the upper lip? We shall answer this question with an extract from an article 'On the Use of the Hair' in the *Lancet* for November 3, 1860: 'Mr Chadwick, who has done so much for sanitary reform, tells us that he was once very much struck by seeing some blacksmiths who wore beards, with their moustaches discoloured by a quantity of iron dust which had accumulated amongst the hairs. Turning it over in his mind, it struck him that had not the dust been so arrested by a natural respirator, it must have found its way into the lungs, where it could not have been otherwise than productive of evil consequences. He hence rightly advised that the razor should be discarded by labourers in all dusty trades—such as millers, bakers, masons, &c.; by workmen employed in grinding iron or steel; and by travellers on dusty roads. In hot, sandy countries the use of the beard is soon discovered; and travellers in Syria and Egypt find it necessary to defend their mouths against the entrance of the hot air of the desert. But not against dust alone is the facial hair a protection; it is the best barrier against cold air, biting winds, and wheezy fogs that a Northman can obtain. . . . According to Mr Chadwick, the sappers and miners of the French army, who are remarkable for the size and beauty of their beards, enjoy a special immunity against bronchial affections.' In corroboration of the last-named fact we may mention another of a still more striking character. During the long-continued search for Franklin's expedition, a transport vessel, the *North Star*, was frozen up during one of the severest arctic winters on record, in Wolstenholme Sound. The crew maintained their health perfectly during all the trials to which they were exposed. On their return to England in the early summer they shaved off the hair that had been growing around the mouth and throat for the last eight or nine months, and within a week *every man* was on the sick list with some form of bronchial or pulmonary disorder.

The short hairs scattered over the body may be regarded as being rudimentary. In other words, they are vestiges of a hairy covering which at one time did fulfil a protective and sheltering function. In the Ainos of Japan and the Todas of the Nilgherries these hairs are still retained in a high degree of development.

Cases occasionally occur where there is an abnormal abundance of hair of considerable length in women on parts where the hair is usually little more than down. A hairy woman, named Julia Pastrana, supposed to be a Mexican, was exhibited in London; her embalmed body was exhibited also in that city in 1862, and we extract the following remarks from a memoir on her in *The Lancet* for May 3 of that year: 'The ears, and all parts of the face except the eyes, were covered with hair of different lengths. The beard was tolerably thick, the hairs composing it being straight, black, and bristly, the part of it which grew on the sides of the chin hanging down like two plaits. . . . The upper portion of the back of the neck and the hinder surface of the ears were covered with hairs. On the shoulders and legs the hairs were as abundant as they are occasionally seen on very powerful men.' Dr Chowne described similar but less marked cases of hairy women in the *Lancet* for 1843; and in 1886 members of a Burmese family, whose bodies were almost entirely covered with hair, were first exhibited in London. See BEARD, WIG, BALDNESS, PLICA POLONICA, RINGWORM, SCALDHEAD, PARASITES, &c.; also Sir Erasmus Wilson, *Healthy Skin and Hair* (1845; new ed. 1886).

Hair-balls. See CONCRETIONS.

Hair-dressing. As a matter of convenience, as well as of taste and fashion, the dressing of the hair has received much attention in all civilised nations, ancient and modern. The Beard is the subject of a separate article. Amongst savages the most extraordinary diversity as to the dressing of their hair obtains; some frizzing it to the utmost extent; some fixing it in all sorts of perverse arrangements by means of frames, and some partially shaving the head. The Chinese pigtail, the American Indian scalp-lock, and the Moslem shaven head, with a small tuft left by which to be ultimately lifted into Paradise, are all well known. According to Rev. J. G. Paton, missionary (see his Life, 1889), some of the New Hebrides people have hair crisp and woolly, stuck full of feathers and shells; others have hair long and wavy, twisted into as many as 700 separate whip-cords on a single head, requiring the labour of five years to complete. Amongst modern civilised Europeans the courtiers and cavaliers of the 17th century adopted the practice of wearing those 'love-locks' which excited the ire of the Puritans. It was, however, in the management of ladies' hair that the art of the professional hair-dresser was in those times mainly exercised. In the 18th century, through the influence of French fashions, the dressing of hair, male and female, rose to a great pitch of extravagance and folly (see WIG). The hair of a lady of fashion was frizzed up in convolutions and curls, decorated with ribbons, jewels, and feathers, and filled with pomatum and powder to a degree perfectly monstrous. As women of less exalted rank slavishly attempted to follow these absurdities, the business of dressing hair was extensively followed. The cost of a full dressing being, however, too high to be lightly incurred, often one dressing was made to suffice for a week or fortnight, during which period such care was taken to preserve the greasy fabric undisturbed, that it became the frequent resort of troublesome insects. From pressure of business it frequently happened that previous to balls ladies' hair had to be dressed one or two days in advance; and to keep the head-dress uninjured the lady sat in a chair perhaps two nights instead of going to bed. A tax on Hair-powder (q.v.), along with the simplification of fashions consequent on the French Revolution, not only expelled hair-powder and perruques, but brought the profession of hair-dresser within reasonable bounds. As regards ladies' hair, fashion is constantly altering. With respect to men's hair, short cutting is now universal. Pursued as an ordinary business in England and continental countries, hair-dressing in the United States is to a large extent resigned to men of colour, and in connection with many of the hotels they are provided with work-rooms. Of the innumerable oils, essences, and pomade which are vended for the hair, on the doubtful assumption that they improve and nourish it, some are distinctly injurious.

Hair-dyes. Various means have been adopted for changing the natural colour of the hair to a more favoured one, and for hiding the approaches of age, as indicated by the presence of gray hairs. These usually consist in washing the hair with a

solution of some metallic salt known to have the effect of darkening its colour, such as salts of silver, mercury, lead, and bismuth. Pyrogallic acid is also employed to give a brown tint, while a solution of peroxide of hydrogen in water imparts a fine golden colour. The most perfect mode of dyeing the hair black is that of previously preparing it by a complete soaking with a solution of sulphide of potassium; the strength of this solution must depend on the depth of tint intended to be given; the stronger the solution the darker the colour will be. When thoroughly wetted, the hair is allowed to dry partially; and whilst still damp it is to be saturated with a solution of nitrate of silver, of a strength proportionate to the depth of colour desired. This makes a very permanent dye, which only requires renewing where the new growth of hair becomes conspicuous. The fashion of dyeing the hair is very ancient, and belongs as much to savage as to civilised nations; but in the case of the former vegetable dyes have been chiefly used. In China and other eastern countries the juice of the petals of *Hibiscus Trionum*, the Bladder-Ketmia, and probably other species of Hibiscus, is in general use.

The detection of stained hair is sometimes an object of medico-legal investigation. Lead may be detected by boiling the hair in dilute nitric acid, and then applying the tests for Lead (q.v.) to the acid solution; while the presence of silver may be shown by digesting the hair in dilute hydrochloric acid or chlorine water, when the resulting chloride of silver may be dissolved out with a solution of ammonia, and submitted to the ordinary tests for Silver (q.v.).

Hair-eel, the form into which horse-hairs left to soak in running water are preposterously assumed by many to develop. The hair-eel or horse-hair worm is really a Nematode (q.v.); see also Eel, Thread Worms.

Hair Grass (*Aira*), a genus of grasses, having delicately panicled inflorescences, bearing spikelets with two unequal glumes, and two perfect flowers, each with two thin membranous bracts, of which the outer is generally awned. The species are natives of temperate and cold climates. Five species are natives of Britain, and are chiefly found in moors, sandy pastures, and other situations where the soil is unfertile. The Tufted Hair Grass, or Turfy Hair Grass (*A. cæspitosa*), common in better pastures and meadows, is a beautiful grass when in flower, but forms coarse tufts of very rough leaves, which are usually rejected by cattle. It attains a height of 2 to 4 feet, and is sometimes used for thatching ricks of hay or corn, and in some places for making mats. It grows luxuriantly in moist situations, and indicates a badly drained soil. It is occasionally tolerated, in order to add to the bulk of *Bog Hay* in moorish grounds, but is carefully extirpated wherever agricultural improvement takes place. This grass is, however, sometimes sown to form cover for game, particularly hares; and in marshy situations for snipes and wild fowl. It is the *readhstra* of the Scotch.

Hair Manufactures. In this article the various kinds of hair (except wool) used in manufactures are noticed, together with the different fabrics or articles made from them. Remarks on a few of these will be found under Alpaca, Bristles, Brush, and Fibrous Substances. For sheep's wool, which like fur is modified hair, and the similar animal fibres mohair and alpaca, see Woollen Manufactures. Fur-covered skins used for articles of dress in their natural condition, with just sufficient treatment to preserve them, are described under Fur; while the employment of wool, fur, and hair in the manufacture of felted goods is noticed under the headings Felt and Hat.

Human Hair. The trade in Britain in this is considerable, supplies of it being chiefly obtained from continental Europe, India, and China. The hair shipped from Asiatic countries is coarse, that from Germany and Scandinavia is light-coloured, and that collected in Italy and southern France is dark. In former years an occasional supply of good quality was got from Ireland. Hair 8 inches long is worth about 1s. per ounce, while such as extends to the length of 3 feet sometimes reaches as high a price as 30s. per ounce. Certain colours, such as pure golden, are of greater value than more common kinds, and hair from the living subject is much better than dead hair. Human hair is worked up into watch-guards, brooches, bracelets, and other personal ornaments, the patterns of which are often very beautiful. In the article Wig this and other imitations in hair of the natural covering of the head are noticed.

Horse hair. The comparatively small quantity of this hair obtained in England is got from the combings of tails and manes, but it is of excellent quality. Horse-hair is imported from Russia, Germany, Belgium, South America, and Australia; the imports for the five years ending 1888 averaging nearly 20,000 cwt. annually. The United States import hair to the value of from 2¼ to 2½ million dollars annually; exporting a value of from 350,000 to 420,000 dollars. Hair combed from the tails of horses is the most valuable, that from the mane being of inferior quality. The former is designated 'hard,' and the latter 'soft,' while the hair is further distinguished by the terms 'live' and 'dead,' according as it has been taken from the animal before or after death. 'Live' hair commands the highest price. White is the most valuable kind as regards colour, as it is suitable for dyeing bright tints, and the best hair is obtained from wild horses.

Horse-hair undergoes three sortings—viz. into sorts according to length, into different colours, and into various qualities. After this the hair is washed generally in warm soap baths and in water slightly heated, to which lime or potash has been added. The hair, except the white sort, which is to be bleached, is, after cleaning passed through a dye bath in which logwood is the chief ingredient. Short hair being used for stuffing in upholstery work, and long hair chiefly for the manufacture of haircloth, the two kinds after the above treatment undergo different processes.

Short horse-hair, although best for the purpose when used alone, is nevertheless mixed with cow and pig hair for stuffing chairs, sofas, and the like. Different blends of these are made, and the three kinds thoroughly incorporated by suitable machines, after which the mixture is beaten and screened to clear it of dust. Then follows the 'curling' process, by which the hair is first spun into ropes, which are next twisted into much shorter lengths, and by a third operation further twisted till they get into a convolute shape. The curl thus given requires to be fixed by placing the hair in cold water for several hours, and afterwards in an oven, where it is kept for some time at a high temperature. This baking also destroys the eggs of obnoxious insects. The hair in this rope form requires to be teased up for use. For inferior stuffing vegetable fibres are now mixed with hair.

Haircloth.—Long horse-hair is combed on steel combs, and separated into different lengths and thicknesses, about 3 feet being the longest size. The chief application of long hair is in the manufacture of haircloth, which is generally though not always black. Even when naturally black the hair is dyed to give it a uniform colour. White hair is

bleached and dyed different colours. The length of the hair determines the width of the cloth, since the weft is formed of single hairs. Strong linen or cotton twist commonly form the warp. Up to the middle of the 19th century a child at one side of a handloom supplied a hair to the weaver for each throw of the shuttle, to which the hair was hooked. A subsequent invention made it practicable to dispense with the child or server, the weaver by means of a treadle working both the hook-shuttle for drawing through, and the batten for driving home, the weft hairs; and at the same time supplying these hairs with his or her own hands.

The power-loom, invented by Mr Isaac Lindsley, of Pawtucket, Rhode Island, was the first successful attempt to supersede the hand-loom in the weaving of haircloth. In it the end of an arm or rod, made to operate like a finger and thumb, grasps the hairs as they are presented to it by a picker which takes up a single hair from a bunch, and this hair is then carried by the rod through the shed of the warp. This loom has been extensively used in the manufacture of haircloth. In some more recent ones, however, the working parts have been simplified, and an important arrangement introduced by which the thin and the thick ends of the hair are taken up by the picker alternately.

Haircloth is so woven that only the hair portion is seen on the surface, the linen or cotton warp being hidden. Most of what is made in England is plain, but some haircloth damasks, both black and coloured, are woven; so also are striped pieces of various colours. These ornamental kinds, which are well suited for elegant furniture in tropical regions, are largely made on the Continent. In some special kinds of fabric both warp and weft are of horse-hair. Among these are sieve-bottoms for cooks, chemists, and powder manufacturers. Other examples are press-cloths used in making cider, and tailors' ironing cloths. Horse-hair is worked up into ornamental cord-like or braid-like forms (crinoline) for ladies' bonnets, into borders and cords for carriages, into material for cigar-cases and similar articles, and into fishing-lines.

'Brussels' carpet of horse-hair was introduced by Mr E. Webb of Worcester. Several kinds of carpet partly or wholly composed of this material are now made. In these tissues the hair is not woven in the same way as it is in ordinary haircloth, but as a yarn for which short hair, sometimes mixed with the hair of other animals, is generally used. The material is carded, spun, and twisted. Some carpets have both warp and weft of hair; others have only a plain warp of hair with a weft of jute; others again have a backing and weft of hemp, jute, or cotton, and the pile warp of horse-hair. These carpets are extremely durable, and therefore well suited for offices and other rooms in which there is much traffic.

Cow-hair is consumed in considerable quantities by plasterers to bind the plaster put on the internal walls of houses. As already stated, it is mixed with horse-hair for stuffing purposes, and with wool for common blankets, carpets, rugs, and other articles. Cow-hair is also used in the manufacture of roofing and other felts. This kind of hair is obtained in considerable quantities from tanneries. The imports of it in 1888 amounted to 95,000 cwt.

Camel-hair is obtained from the legs, the neck, and the humps of both species of Camel (q.v.). The hair of the Arabian camel is fine and light-coloured; that from the Bactrian camel is coarser, and of a darker shade. It, however, varies in degree of fineness according to the age of the animals, young ones yielding the finest kind. In Tartary, Persia, Arabia, and other eastern countries camel-hair is woven into a soft, warm, and durable cloth for personal wear. It is also made into carpets, tent-coverings, and other articles. Since 1860 a good deal of this hair has been sent to Europe and America for weaving into carpets and for mixing with wool; in the case of the finer kinds, for warm clothing. The so-called camel-hair brushes are made from the tail of the sable or of some kinds of squirrel.

Goat-hair.—The hair of the common goat is used for the manufacture of cheap carpets and for other purposes, but that of the Angora or mohair goat is now a very important material in our textile industries. This mohair, as it is called, is described under WOOLLEN MANUFACTURES, and the fine wool forming part of the fleece of the Cashmere or shawl goat is noticed under CASHMERE GOAT, SHAWL.

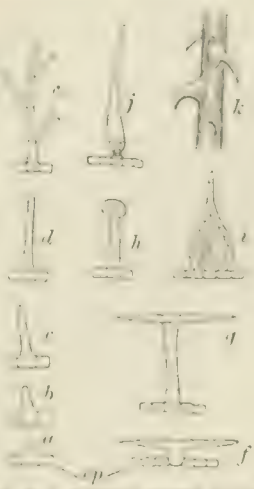
Pig-hair or Bristles. Some pig hair is mixed with other kinds for stuffing. The principal use of this material, however, is for making brushes. See BRISTLES and BRUSHES.

Elephant's Hair.—The strong hair of the elephant's tail is occasionally turned to some use. For example, a native bracelet is employed by some of the tribes in Nyassaland, which consists simply of two such hairs plaited.

Hair-powder, a pure white powder, made from pulverised starch, scented with violet or some other perfume, and at one time, especially in the 17th and 18th centuries, largely used for powdering over the head. The fashion became universal among the higher and middle classes, and by ladies as well as gentlemen. To make the powder hold, the hair was usually greased with pomade, and accordingly the fashion was extremely troublesome. An act of parliament fixed that the fine dust of which the powder was composed should be made from starch alone; and we learn from the *Gentleman's Magazine*, that on November 20, 1746, fifty-one barbers were convicted before the Commissioners of Excise at London, and fined £20 each, for having in their keeping hair-powder not made of starch, contrary to act of parliament. In 1795 a tax of a guinea (afterwards £1, 3s. 6d.) was put on the use of hair-powder, and at one time yielded £20,000 per annum, but it had the effect of causing hair-powder to fall into general disuse. The French Revolution, which overturned so many institutions, contributed also to the people of Europe returning to natural and unpowdered hair. At the present day powder continues to be used by some of the footmen of the nobility and higher ranks as part of their livery. The tax on hair-powder was repealed in 1869. At the time of its abolition it was paid by about 800 persons, and yielded a revenue of about £1000 a year.

Hairs of Plants are outgrowths of epidermal cells, which assume various forms. They may remain unicellular, resembling simple tubes, or become multicellular by division of the originally simple cell. They develop on almost any part of the surface of plants; and there are few plants that are entirely without them. A plant may have only one form of hair; but most plants have several forms. Similar kinds of hairs are often characteristic of plants belonging to the same order—e.g. the glandular hairs of the sun-dew (Drosera) order, the stinging hairs of the nettle (Urtica) order, and the scaly hairs of ferns. Root-hairs (see ROOT) are among the simplest in form; they are always unicellular tubes which absorb water and certain minerals essential for the life of the plant. The aerial organs of plants develop hairs which serve to protect them from cold, or injury from other sources—e.g. many winter buds have hairy scale leaves which often, with a gummy secretion, keep out moisture, and thus protect the tender tissues from injury by frost. Many leaves also are protected from excessive radiation by the

growth of hairs. The common form of glandular hair is that with a swollen tip which secretes oily or resinous, often strongly smelling, matters which may be regarded as waste-products that have become adapted to the attraction and capture of insects: see INSECTIVOROUS PLANTS. Some glandular hairs have the glands within their bases. In the orders Compositæ and Valerianeæ hairs form on the fruit an organ of flight (*pappus*), by means of which the wind is enabled to carry the seeds, and thus secure their wide distribution. When hairs become stiff, generally by impregnation with silica, they form bristles; and when they become woody and hard they form prickles, as in the bramble and rose. Hairs may also grow internally in large intercellular spaces, but these occur only in a few plants.



[illegible] different forms in the leaf-epidermis of [illegible]: *d*, [illegible]; *e*, [illegible]; *f*, stinging hair with drop of poison at the top (all the above are in section); *g*, prickle-bearing; *h*, epidermis.

Hair-tail (*Trichiurus*), a genus of acanthopterous fishes belonging to the tropical marine fauna, and found generally near land. The body is long, scaleless, greatly compressed, ribbon-shaped, and ends in a long, whip-like tail. The cleft of the mouth is deep, and there are strong teeth on the jaws and the palate. The dorsal fin extends along the whole of the back and is spiny throughout; the ventral fins, when present, are in the form of a pair of scales; the anal spines are small, and are sometimes concealed beneath the skin. Six species are known. Some of them attain a length of four feet. One species, the Silvery Hair-tail or Ribbonfish (*T. lepturus*), is found in the Atlantic Ocean, on the east coast of North America, from Cape Cod to Florida and the West Indies. Wanderers are caught off the British and Irish and more rarely the French coasts. The other species are most common in the seas of India, the Malay Archipelago, and China. As food they are held in various estimation in different places.

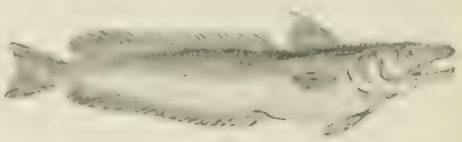
Haiti. See HAYTI.

Haje. See COBRA.

Hajipur, a town of Bengal, on the Gandak, just above its confluence with the Ganges opposite Patna. It has a large river trade. Pop. 25,078.

Hajj, or HADJ, from an Arabic word meaning 'pilgrimage,' emphatically the pilgrimage to the Kaaba (q.v.) or black stone in the great mosque at Mecca, which every Mohammedan whose means and health permit is bound to perform once at least in his life (see MECCA). The hajj once performed, the pilgrim never omits to prefix the proud title of Hajji to his name. Those who are incapacitated through bodily infirmity from performing the holy journey themselves may send a substitute, who acts as their representative in almost every respect, but this substitute has no share whatever in the merits and rewards belonging to the Hajj. Members of the Greek and Armenian churches who perform the pilgrimage to Jerusalem are likewise known as Hajji.

Hake (*Merluccius*), a genus of fishes of the cod family (Gadidæ), having a flattened head, an elongated body, two dorsal fins, of which the first is short, and the second very long, one very long anal fin, and the mouth destitute of barbels. One species, the Common Hake (*M. vulgaris*), is found in the British seas, in those of the north of Europe, and in the Mediterranean. It is sometimes 3 or 4 feet in length; and is of a whitish colour, grayish on the back. It is a very voracious fish, devouring great numbers of herrings and pilchards; hence it



Hake (*Merluccius vulgaris*).

is frequently called the *Herring Hake*. It is a coarse fish, its flesh white and flaky; but it is important as an article of human food and of commerce, being salted and dried in the same manner as cod and ling, in common with which it receives in this state the name of *stock-fish*. It is generally taken by lines, like cod and ling. In the spawning season, when it keeps near the bottom, it is sometimes caught by trawl nets. One other species is known, *M. gayi*, which is common in the Strait of Magellan and on the coasts of Chili, and also occurs in New Zealand.

Hakim Ben Allah. See MOKANNA.

Hakluyt, or HACKLUYT, RICHARD, an English writer on geography, belonged to a Herefordshire family, and was born in 1553. While at Westminster School he eagerly perused narratives of voyages and travels, and continued this course at Christ Church, Oxford, whither he proceeded in 1570. Being appointed lecturer on geography or cosmography in that university, he introduced the use of globes and other geographical appliances into English schools. The publication of *Divers Voyages touching the Discovery of America* (1582) seems to have been mainly instrumental in procuring for him two years later the appointment of chaplain to the English embassy to Paris. There he wrote *Discourse concerning Western Discoveries* (1584), and had Laudonnière's manuscript narrative of the discovery of Florida printed, first in French and afterwards in English, at his own expense. On his return to England in 1588, with the assistance of Sir Walter Raleigh, he began to collect materials for the history of the discoveries made by his countrymen. He published the fruits of his researches, in notices of more than 200 voyages, under the title *Principal Navigations, Voyages, Traffiques, and Discoveries of the English Nation* (3 vols. 1598–1600; new ed. 5 vols. 1809–12). Government rewarded him by bestowing upon him a prebend in Westminster Abbey. *A Selection of Curious, Rare, and Early Voyages and Histories of Interesting Discoveries*, &c., chiefly published by Hakluyt, or at his suggestion, but not included in his compilation, forms (1812) a supplement to the above work. He also edited English translations of Galvano's *Discoveries of the World* (1601) and Fernando de Soto's *Virginia richly Valued* (1609). He died in 1616, and was buried in Westminster Abbey. Hakluyt's unpublished manuscripts were made use of by Purchas in his *Pilgrims* (1625–26). The *Hakluyt Society* was instituted in 1846 for the purpose of publishing all the histories of the earlier voyages and travels.

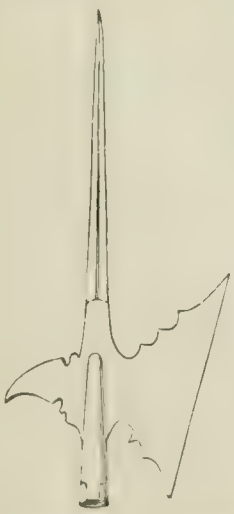
Hakodate, the chief port of Yezo in Japan, situated on a peninsula in the Strait of Tsugaru. The town is built partly on the inner slope of the Gibraltar-like hill (1200 feet) which dominates the strait, partly on the low sandy peninsula connecting the hill with the main island. The climate is severe. Hakodate, which has a magnificent harbour, is (since 1859) one of the open ports of Japan, and carries on a brisk export trade in seaweed, sulphur, bêche de mer, salted salmon, matches, &c. The annual value of exports is towards £200,000; that of imports is trifling. Pop. (1893) 63,916.

Hal, a town in South Brabant, 9 miles by rail SSW. from Brussels. The church of St Mary (1341–1409) is much resorted to by pilgrims on account of a black miracle-working wooden image of the Virgin, which during a bombardment in 1580 caught thirty-three cannon-balls in her lap—they lie piled up in the tower. Pop. 9739.

Halacha. See EXEGESIS, TALMUD.

Halas, a town of Hungary, in the district of Little Cumania, 82 miles by rail SSE. of Budapest. Pop. 15,039.

Halberstadt, a quaint old town of Prussian Saxony, situated in a fertile plain extending from the north foot of the Harz Mountains, 25 miles SW. of Magdeburg. The cathedral, containing fine painted glass, and valuable antiquities and objects of art, although restored in 1850–71, is the most notable building in the town. It was erected in the 13th and 14th centuries in the Pointed style. Other buildings of interest are the church of Our Lady (1146), with antique reliefs and wall-paintings; the town-house (1360–81), before which stands a Roland pillar; the wine-cellar beneath the town-house; and the Peterhof, formerly the residence of the bishops. The chief industries of the town are gloves, cigars, machines, sugar, leather, paper, spirits, &c.; and there are also large workshops for railway repairs. Halberstadt dates from 820, the year in which the see was transplanted from Osterwieck to the site of the town of Halberstadt. It received town rights in 998; was twice burned down in the 12th century; and was held alternately by the Swedes and Imperialists during the Thirty Years' War. In 1648 it was given to Brandenburg. Pop. (1875) 27,800; (1890) 36,786. See Zschiesche, *Halberstadt sonst und jetzt* (1882).



Ancient Halbert-head.

Halbert, or HALBARD, a weapon which consisted of a strong wooden shaft about 6 feet in length, surmounted by an instrument resembling an axe, balanced on the opposite side by a hook or pick, whilst the shaft was continued in a sharp pike-head. The weapon was much used in Germany, Switzerland, and France. In England it was a common arm from the reign of Henry VII. to that of George III. Now it is rarely seen except as borne by yeomen of the guard and others on certain ceremonial occasions. A variety of the same weapon may be recognised in the Scottish Lochaber Axe (q.v.).

Halcyon Days, a name given by the ancients to the seven days which precede and the seven which follow the shortest day of the year, on account of a fable that during this time, while the halcyon bird or Kingfisher (q.v.) was brooding, there always prevailed calms at sea. From this the phrase 'halcyon days' has come to signify times of happiness and tranquillity.

Haldane, ROBERT, was born in London, February 28, 1764, and was educated at the grammar-school of Dundee and the university of Edinburgh. In 1780 he joined the *Monarch*, his uncle Viscount Duncan's ship, afterwards saw some service under Admiral Jervis, and was present at the relief of Gibraltar, but left the navy at the peace of 1783 to settle on his estate near Stirling. The French Revolution fired him with new hopes for the regeneration of man, but ere long a profound spiritual change turned the energies of his life into completely new channels. His vast project for a great mission in Bengal, at his own expense, was frustrated by the East India Company's refusal of their sanction; but by his 'Society for the Propagation of the Gospel at Home' he built so many 'tabernacles' and supported so many itinerant preachers that in twelve years he had expended more than £70,000. In the year 1817 he lectured to theological students at Geneva and Montauban, and returned to Scotland in 1819, taking an active interest thereafter in all religious questions, as the Apocrypha and Sabbath controversies. He died 12th December 1842. His best-known books are *Evidences and Authority of Divine Revelation* (1816), *On the Inspiration of Scripture* (1828), and *Exposition of the Epistle to the Romans* (1835). JAMES ALEXANDER, brother of the preceding, was born at Dundee, July 14, 1768, and was educated at the High School and university of Edinburgh. At sixteen he entered the navy, and served for nine years, after which he abruptly abandoned the service, although in the meantime he had been appointed to the command of a vessel. A study of the Bible had led him to the same conclusions in religion as his elder brother. Soon afterwards he made the acquaintance of the famous Simeon of Cambridge, and with him traversed Scotland on an evangelistic tour. His later missionary journeyings brought him into collision with the Church of Scotland, and at length in 1799 he was ordained the independent pastor of a church in Edinburgh, in which he preached gratuitously for fifty years, and which in 1808 he led into the Baptist fold. He died 8th February 1851. His pamphlets were widely read in their day by those within the range of his influence. Two late books were his *Doctrine of the Atonement* (1845) and his *Exposition of the Epistle to the Galatians* (1848). See *Memoirs of R. and J. A. Haldane*, by Alexander Haldane (1852).

Hale, JOHN PARKER, an American statesman, was born at Rochester, New Hampshire, in 1806, and was United States attorney for his state in 1834–41. Returned to congress in 1842, as a Democrat, his name was afterwards removed from the party ticket because he refused to support the annexation of Texas. The struggle that followed ended in a victory for the anti-slavery party, and in 1847 Hale was elected to the United States senate, where he served for sixteen years. He was the Free-soil candidate for the presidency in 1852, but received under 5 per cent. of the total popular vote. He was minister to Spain from 1865 to 1869, and died 19th November 1873.

Hale, SIR MATTHEW, Lord Chief-justice of England, was born 1st November 1609 at Alderley, Gloucestershire. Intended for the church, he was sent to Oxford University in his sixteenth year. But suddenly he abandoned his studious habits, and, joining a company of strolling-players, gave way to a good deal of dissipation. He was on the

point of becoming a soldier when Serjeant Glanville induced him to adopt the legal profession. Accordingly in 1628 Hale entered the Society of Lincoln's Inn, and resuming his habits of persevering study was in due course called to the bar 1637. He soon acquired a considerable practice. In the quarrel between king and parliament Hale refrained from identifying himself with either side. When, however, parliament got the upper hand, he signed the Solemn League and Covenant, sat in the Assembly of Divines at Westminster, tried to bring about a settlement between the king and parliament, and ultimately, taking his engagement to the Commonwealth, was made a judge under Cromwell in 1653. He acted as a *puisne* judge of the Common Pleas till Cromwell's death, but refused to have his commission renewed by Richard Cromwell. After the Restoration he was made Chief baron of the Court of Exchequer, and eleven years later was transferred to the Chief justiceship of the Court of King's Bench. As a judge he was acute, learned, and sensible, and set his face against bribery, one of the vices of the age. He was a pious man and a friend of Richard Baxter, but, like Baxter, was not able to rise superior to the belief in witchcraft. He wrote numerous works, as *History of the Pleas of the Crown* (1739), *History of the Common Law of England* (1713), and various *Moral and Religious Works* (ed. by Thirlwall, 1805); and he bequeathed several valuable legal MSS. to Lincoln's Inn. He resigned his office from ill-health in February 1676, and died on Christmas day of that year. See Lives by Burnet (1682), Williams (1835), Roscoe (1838), and Campbell (1849).

Hale, NATHAN, an American soldier, who was born at Coventry, Connecticut, 6th June 1755, rose to the rank of captain in the Continental army, and, having volunteered to penetrate the British lines and procure intelligence for Washington, was detected, and executed as a spy in New York city, 22d September 1776. See Lossing, *The Two Spies, Nathan Hale and John Andre* (New York, 1886).—His grand nephew, EDWARD EVERETT HALE, was born in Boston, Massachusetts, 3d April 1822, graduated at Harvard in 1839, and was admitted to the Congregational ministry in 1842. In 1856 he was called to the South Congregational (Unitarian) Church in Boston, and in 1879 he received his doctorate from Harvard. His influence in philanthropic movements has been widespread. His book *Ten Times One is Ten* (Boston, 1870) originated in America a numerous series of 'Lend a Hand' clubs, sometimes under other names, and with offshoots in Europe, Asia, Africa, and the Pacific Islands; a recent development in the United States is the society of 'The King's Daughters.' The motto of these clubs is 'Look up and not down; look forward and not back; look out and not in; and lend a hand.' Dr Hale has edited several religious and other journals, as well as Lingard's *History of England*, and original documents (from the British state papers and the British Museum) bearing on the founding of Virginia. His published books, mostly stories, number nearly fifty.

Hale, SARAH JOSEPHA, author of *Mary's Lamb*, was born at Newport, New Hampshire, October 24, 1788. On the death of her husband, David Hale, in 1822, she devoted herself to authorship, and became in 1828 editor of the *Ladies' Magazine*, which she continued to conduct after it had, in 1837, become united with *Godey's Lady's Book*, nor did she retire from her editorial work until 1877. She was instrumental in procuring the employment of lady medical missionaries, in completing the Bunker Hill monument, and in securing that Thanksgiving Day should be simultaneously observed in all the states. She published nearly twenty works, including poems, cookery books, books of poetical extracts, and novels. Her most important work is *Woman's Record, or Sketches of Distinguished Women* (3d ed. 1869). She died 30th April 1879.—Her son, HORATIO (1817-96), in 1837 graduated at Harvard, and was appointed ethnologist to the United States Pacific exploring expedition. He prepared the valuable expedition report on *Ethnography and Philology* (1846), and has published numerous memoirs and works on kindred subjects, including *Indian Migrations as evidenced by Language* (1883), *The Iroquois Book of Rites* (1883), a *Report on the Blackfoot Tribes*, presented to the British Association in 1885, and his introductory address, delivered as president of the Anthropological Section of the American Association in 1886, on *The Origin of Languages and the Antiquity of Speaking Man*.

Halepa, a suburb of Canea (q.v.), where in 1869 the Turks made concessions to the Cretans.

Hales. See ALEXANDER OF HALES.

Hales, JOHN, the 'Ever-memorable,' was born at Bath in 1584, and was educated in 'grammar learning' in his native city. At thirteen he entered Corpus Christi College, Oxford, took his degree in July 1603, and obtained a fellowship at Merton College in 1605 as 'a person of learning above his age and standing.' Wood tells us of his extraordinary subtlety in philosophical disputation, of his eloquence, and of his unusual knowledge of the Greek tongue, which contributed greatly to Sir Henry Savile's edition of St Chrysostom, and procured for himself in 1612 the chair of Greek in his university. Next year he delivered the funeral oration of Sir Thomas Bodley, and was admitted a Fellow of Eton. In 1618 he went to the Hague as chaplain to the ambassador, Sir Dudley Carleton, for whom he made a report of the proceedings at the famous synod of Dort, in a very interesting series of letters. Here the passion and contentious zeal of extreme orthodoxy seem to have convinced him that neither side possessed the monopoly of truth, and indeed that it is a hopeless attempt to express spiritual truth within precise dogmatic definitions. According to his friend Farindon, 'there he bid John Calvin good-night, as he often told.' Early in 1619 he returned to Eton to devote himself to continuous study, varied only by a journey to London once a year. Yet he was no melancholy recluse, but delighted in the conversation of such friends as Chillingworth, Lord Falkland, Savile, and Sir Henry Wotton, as well as Ben Jonson, Suckling, and other London wits. His too liberal *Tract concerning Schism and Schismatics* brought him under the displeasure of Laud, who was, however, satisfied after a personal conference and an apologetic letter, and appointed him to a canonry at Windsor, the only preferment Hales could ever be induced to accept. No doubt he allowed himself to be persuaded, because he loved peace better than argument; and Peter Heylin's account of how Hales told him that Laud's logic had 'ferreted him from one hole to another' need not be taken too literally, being, as Hallam says, ludicrous, considering the relative abilities of the two men. The Puritan supremacy deprived him of his office, and reduced him to great want, which Andrew Marvell said well was 'not one of the least ignominies of that age.' He was forced to dispose of his fine collection of books, which must have been the keenest trial to his scholar's heart. He died at Eton, 19th May 1656.

Hales is a rare example of a profound student without pedantry, a ripe theologian with an altogether untheological clearness of mind and direct-

ness of phrase. His conviction that dogmatic differences do not really affect religion, and his zeal for freedom of spirit rather than rigidity of form, belong not to his own time, but were qualities well becoming the dear friend of Falkland and Chillingworth. The genial sweetness of his temper and the humble modesty of his bearing fitted well with a singularly devout but unobtrusive piety, and help to account for the unwonted glow of warmth in the accounts of him by Clarendon, Pearson, Marvell, and Stillingfleet alike. Aubrey's false imputation of Socinianism has done much wrong to the memory of one of the most loyal although enlightened sons of the Church of England; but we have to thank his rambling pen for a glimpse of the gentle and cheerful little scholar not a year before his death, 'in a kind of violet-coloured cloth gown with buttons and loops,' the *Imitation* in his hand. His picture is one of the finest in the gallery of Clarendon, whose own words best help to explain the large tolerance of his temper and his broad conception of Christianity: 'He had, whether from his natural temper and constitution, or from his long retirement from all crowds, or from his profound judgment and discerning spirit, contracted some opinions which were not received, nor by him published, except in private discourses, and then rather upon occasion of dispute than of positive opinion; and he would often say his opinions, he was sure, did him no harm, but he was far from being confident that they might not do others harm, who entertained them, and might entertain other results from them than he did; and therefore he was very reserved in communicating what he thought himself in those points in which he differed from what was received.

'Nothing troubled him more than the brawls which were grown from religion; and he therefore exceedingly detested the tyranny of the Church of Rome, more for their imposing uncharitably upon the consciences of other men than for the errors in their own opinions; and would often say that he would renounce the religion of the Church of England to-morrow if it obliged him to believe that any other Christians should be damned; and that nobody would conclude another man to be damned who did not wish him so.'

His friend Anthony Farindon (1598–1658) undertook to collect his writings, and write a memoir, but died before his task was completed. In a letter to his publisher he says, 'I am like Mr Hales in this, which was one of his defects, not to pen anything till I must needs.' And indeed all Hales's writings, valuable as they are, are occasional and unsystematic in form. The *Golden Remains of the Ever-memorable Mr John Hales of Eton College* were at length published in 1659 under the care of Pearson, who prefixed not a Life but an Epistle to the Reader, containing a most eulogistic character of his author. This edition was reprinted in 1673 and 1688, and in 1677 a new volume gave several additional tracts. The best edition is that issued in three small volumes by the Foulis Press at Glasgow in 1765, edited by Sir David Dalrymple, afterwards a Scottish judge with the title of Lord Hailes. See chap. 4, vol. i., of Tulloch's *Rational Theology in England in the 17th Century* (1872).

Hales, STEPHEN, natural philosopher, was born at Beckesbourn, Kent, 7th September 1677. He entered Bene't (now Corpus Christi) College, Cambridge, in 1696, was elected Fellow in 1702, and having taken holy orders was presented about 1710 to the perpetual curacy of Teddington, in Middlesex, where he died, 4th January 1761. His first important publication was *Vegetable Staticks, or Experiments on the Sap of Vegetables* (1727), which may be regarded as the starting-point of our true knowledge of vegetable physiology. In *Hæmastaticks* (1733), a second part of this work treating of the circulation of the blood, Hales gives results obtained by experimental methods of investigation like those now in use in studying physiology. Besides other independent works, including *The Means of Dissolving the Stone in the Bladder*, he contributed numerous memoirs to the *Philosophical Transactions* on Ventilation, on Electricity, on the Analysis of Air, &c. His ventilating-machines were introduced into the London prisons. His improvements in the mode of collecting gases did much to facilitate the subsequent labours of Black, Priestley, and Lavoisier. He also invented machines for distilling sea-water, preserving meat, &c.

Halesowen, a market-town of Worcestershire, on the river Stour, 7½ miles WSW. of Birmingham. Its people are nail-makers and manufacturers of small ironwares. One mile to the south-east lie the ruins of the Premonstratensian abbey founded by King John. Shenstone (1714–63), a native of the place, carried on his landscape-gardening at the Leasowes, a mile distant from Halesowen. His tomb is in the church. Pop. 3338.

Halévy, JACQUES FRANÇOIS FROMENTAL ÉLIE, composer, was born of Jewish family at Paris, 27th May 1799. He studied at the Conservatoire there under Berton and Cherubini, afterwards at Rome, devoting himself especially to the old church music of Italy, and on his return strove in vain to put on the boards his operas, *La Bohémienne* and *Pygmalion*. His next operas, *L'Artisan* (1827) and *Le Roi et le Bâtelier* (1828), were failures, but *Clari* (1828), in which Malibran took the chief rôle, and the comic opera, *Le Dilettante d'Avignon* (1829), were successes, and ere long Halévy found himself the composer of the day, and his masterpiece, *La Juive* (1835), carried his name over Europe. His next best work is the comic opera, *L'Éclair* (1835). Later works represented with greater or less success are *Guido et Ginevra*, *Les Treize*, *Le Drapier*, *Le Guitarrero*, *La Reine de Chypre*, *Les Mousquetaires de la Reine*, *Le Val d'Andorre*, *La Tempête*, and *Dame de Pique*, the last two with the libretto by Scribe. Halévy died at Nice, 17th March 1862. Among his pupils were Gounod, Victor Massé, Bazin, and George Bizet, who married his daughter. He worthily carried on the succession of the great school of French opera, midway between Cherubini and Meyerbeer—sharing the perfect mastery of resource of the former and the tendency of the latter to subordinate everything to effect, and instinctively avoiding the commonplace or vulgar. Admitted to the Academy of Fine Arts in 1846, he became perpetual secretary in 1854. His *éloges* were collected as *Souvenirs et Portraits* (1861), and *Derniers Souvenirs et Portraits* (1863). His Life was written by his brother Léon (2d ed. 1863) and by Pougin (1865).

LÉON HALÉVY, brother of the foregoing, was born at Paris, 14th January 1802, studied law, filled a chair in the Polytechnic School, and afterwards, from 1837 to 1853, a post in the Ministry of Instruction, which he resigned to give himself entirely to literature. He died at St Germain-en-Laye, 3d September 1883. He wrote the introduction to Saint-Simon's *Opinions littéraires, philosophiques, et industrielles* (1825), and afterwards, on his own account, histories, poetry, fables, novels, dramatic poems, and translations of *Macbeth*, *Clavigo*, &c. His best books are *Résumé de l'Histoire des Juifs* (1827–28), *Poésies Européennes* (1837), and *La Grèce Tragique* (1845–61).

LUDOVIC HALÉVY, son of Léon, was born at Paris, 1st January 1834, and in 1861 became secretary to the Corps Législatif. He first made himself known as the writer of the librettos to Offenbach's burlesques (partly in collaboration with Meilhac):

Orphée aux Enfers (1861), *La belle Hélène* (1865), *La Vie Parisienne* (1866), *La Grande-duchesse de Gerolstein* (1867), *Les Brigands* (1870). He wrote besides a large number of vaudevilles and comedies, among them *La Parichole* (1868), *Frontin* (1869), *Tricoche et Cacolet* (1872), *Le Mari de la Débutante* (1878), and *La petite Mère* (1880). His *Madame et Monsieur Cardinal* (1873) and *Les petits Cardinal* (1880) are delightfully humorous sketches of Parisian theatrical life; his *L'Invasion* (1872) was a collection of personal recollections of the war. In 1882 he startled the world with his charming idyllic story *L'Abbé Constantin*, which has been well followed, but not in the same vein, by *Criquette* (1883) and *Deux Mariages* (1883). Halevy was admitted to the Academy in 1886.

Halévy, JOSEPH, an eminent French orientalist and traveller, was born 15th December 1827, at Adrianople. In 1868 he travelled in northern Abyssinia; next he traversed (1869–70) Yemen in quest of Sabæan inscriptions for the French Academy—one of the most fruitful journeys ever made by an archæologist. No European face had been seen in the Jowf since the soldiers of Ælius Gallus had visited it in the year 24 A.D., and Halévy travelled as far north as Bled Nedjran (18° N. lat.), and was able to collect as many as 860 inscriptions. His chief books are *Mission archéologique dans le Yemen* (1872), *Essai sur la Langue Agaou, le Dialect des Falachas* (1873), *Voyage au Nedjrân* (1873), *Études Berbères* (1873), *Mélanges d'Épigraphie et d'Archéologie Sémitiques* (1874), *Études Sabéennes* (1875), *Études sur la Syllabaire Cunéiforme* (1876), *Recherches critiques sur l'Origine de la Civilisation Babylonienne* (1877), *Essai sur les Inscriptions du Safa* (1882), and *Mélanges de Critique et d'Histoire* (1883).

Halfa. See ESPARTO.

Half-blood, related through one parent only. When two persons have the same father, but not the same mother, they are called brothers or sisters consanguinean; when they have the same mother only, they are called brothers and sisters uterine. See SUCCESSION.

Half-pay is an allowance given in the British army and navy to commissioned officers who are not actively employed, and corresponds to the French *demi-solde*.

In the navy, officers are appointed to a ship to serve for the period during which she is in commission. At the end of that period, or if promoted or otherwise removed from her, they are placed on half-pay until again called upon to serve. As the number of naval officers always exceeds that of the appointments open to them, there are at all times many on the non-effective list receiving about 60 per cent. of the pay of their rank.

In the army, *permanent* half-pay, first granted in 1698, was abolished in 1884, *retired* pay being substituted for it. Under the provisions of the royal warrant of 1887, lieutenant-colonels who have held command for four years are placed on *temporary* half-pay (11s. a day) until promoted. Majors of seven years' regimental, or five years' staff service in that rank may claim promotion to half-pay lieutenant-colonelcies, and these or any officers of lower rank may be placed on the half-pay of their rank while incapacitated through ill-health, or as a punishment for inefficiency. Half-pay officers are eligible for any employment suited to their rank, but are not borne on the strength of any regiment.

Seconded officers are those who are extra-regimentally employed, but whose names remain on the rolls of their regiments, additional officers being appointed in their places. On the termination of such employment they are absorbed into the regiment as soon as vacancies occur in their proper rank.

Officers on *retired* pay are liable to be called upon to serve in case of national peril or great emergency.

Haliburton, THOMAS CHANDLER, colonial judge and author, was born at Windsor, Nova Scotia, in 1796, was called to the bar in 1820, and became a member of the House of Assembly. He was raised to the bench as chief-justice of the common pleas in 1829, and in 1842 became judge of the supreme court. In 1856 he retired from the bench, and took up his residence in England. In 1858 he received the degree of D.C.L. from the university of Oxford, and in 1859 entered parliament as Conservative member for Launceston. He is best known as the author of *Sam Slick*, the name of a Yankee clockmaker and pedlar, a sort of American Sam Weller, whose quaint drollery, unsophisticated wit, knowledge of human nature, and aptitude in the use of what he calls 'soft sawder' have given him a fair chance of immortality. The series of newspaper sketches in which this character had first been introduced was published in 1837 as *The Clockmaker, or Sayings and Doings of Samuel Slick of Slickville*; two later series followed in 1838 and 1840, and *The Attaché, or Sam Slick in England*, in 1843. Haliburton's other works include *A Historical and Statistical Account of Nova Scotia; Bubbles of Canada; The Old Judge, or Life in a Colony; Letter-bag of the Great Western; Yankee Stories*, and *Traits of American Humour; Nature and Human Nature; Rule and Misrule of the English in America*; and *Wise Saws and Modern Instances*. He died at Isleworth, 27th August 1865.

Halibut, or HOLIBUT (*Hippoglossus vulgaris*), the largest of all the flat-fish (Pleuronectidæ), in form more elongated than the flounder or the turbot, the eyes on the right side, the upper surface smooth, and covered with small soft oval scales,

Halibut (*Hippoglossus vulgaris*).

the colour brownish, marbled all over with darker markings, the under surface smooth and white. The halibut, though esteemed for the table, is not to be compared in quality with the turbot; its flesh, though white and firm, is dry and of little flavour. It is found from the coasts of Spitzbergen to Iceland, off Newfoundland, &c., and from Finland and Scandinavia to the British and French coasts, but is rare in the Channel. It is abundant off the Orkneys, especially in eddies where tides meet. It is also found on the coasts of New England, New York, California, and Kamchatka. It is a fish of great value to the Greenlanders, who preserve it for winter use by cutting it into long strips and drying it in the air. Oil is obtained from it in considerable quantity, chiefly from the bones. It attains a great size; specimens have

been caught in Europe weighing at least 500 lb., and one caught in Iceland was little short of 20 feet long.

Halicarnassus (originally called *Zephyria*), a Greek city of Caria in Asia Minor, situated on the Ceramic Gulf. It was founded by Dorian colonists from Trœzen, and defended by several citadels, one of which, Salmacis, was deemed impregnable. Early in its history it became one of the cities of the so-called Dorian Hexapolis, from which confederacy, however, it was eventually excluded. When the Persian power spread westward, Halicarnassus readily submitted to the dominion of the conquerors. During this period, however, about 500 B.C., a domestic tyrant, Lygdamis, rose to supreme power as a vassal of Persia; and his descendants, without forfeiting the Greek character, or ceasing to cultivate the Greek literature and arts, gradually extended their sway over all Caria. Amongst them was Mausolus, whose wife and sister Artemisia, to commemorate him after his death (353), erected the magnificent Mausoleum (q.v.) which was accounted one of the seven wonders of the world. It was under this king that the city attained its highest degree of splendour and prosperity. About twenty years later Alexander the Great destroyed the city by fire; but the inhabitants took refuge in the citadel, which successfully resisted his arms. The city was afterwards rebuilt, but it never recovered its ancient importance or prosperity. In the days of the Roman empire it had sunk into comparative insignificance. Halicarnassus was the birthplace of the Greek historians Herodotus and Dionysius. The site of the city is occupied by the modern Budrun. An account of the excavations conducted there will be found in Newton's *Discoveries at Halicarnassus* (1862–63).

Halicore. See DUGONG.

Halicz, a town of Austria, in the crownland of Galicia, is situated on the Dniester, 69 miles SSE. of Lemberg by rail. On a hill in the vicinity are the ruins of the once strongly fortified castle of Halicz, built in the 12th century, and the residence of the rulers of what was formerly the grand principality and kingdom of Halicz. From this word the name Galicia (q.v.) is derived. Pop. 3464.

Halidon Hill, an eminence in Northumberland, 2 miles NW. of Berwick, overlooking the Tweed, was the scene of a bloody conflict between the English and Scots, 19th July 1333, in which the latter were defeated, upwards of 10,000 of them (according to some authorities, 14,000) being left on the field.

Halifax, a thriving market-town, municipal, parliamentary, and county borough, in the West Riding of Yorkshire, is situated on the river Hebble, a feeder of the Calder, on the slope of an eminence, and is almost wholly surrounded by hills. It is 43 miles SW. of York, and 194 miles NNW. of London. Dr Whitaker derives its name from the four ways travelled by pilgrims converging towards the parish church, called Holy Ways; *fax* (as in *Carfax*) being Norman-French for 'forks' or ways. A more popular derivation is that it means 'Holy Face,' from a representation of the head or face of John the Baptist having been at a remote period kept in a chapel where now stands the parish church of St John the Baptist. Its situation is pleasing, and its general appearance handsome; while its ample supply of water-power and of coal, its facilities for transport both by water and by leading lines of railway, and its position in proximity to many of the great towns of the north of England contribute materially to its manufacturing and commercial importance. Some Flemish artisans had settled here in the reign of Henry VII. The ecclesiastical architecture of Halifax strikes every visitor. The parish church of St John, restored in 1879, is a fine specimen of Perpendicular Gothic; 'All Souls,' built at the expense of Edward Akroyd from designs by Sir G. G. Scott, is one of the best and most elaborate of all the churches of which he is the architect. The 'Square Church,' belonging to the Congregational body, was erected in 1855, and there are in all about forty Nonconformist churches. The town-hall, opened by the Prince of Wales in 1863, is a very ornate Renaissance edifice, from designs by Sir Charles Barry; the new post-office was opened in 1887. Another important building is the Piece Hall, erected in 1779 for the reception and sale of manufactured goods; it was presented to the corporation by Sir S. Ibbetson in 1868, and is now used as a Market Hall. Among the numerous public and private educational institutions of Halifax are the Heath grammar-school, founded in 1585, and the Blue-coat School. The school-board has the control of fully two-thirds of the school-children. The Crossley and Porter Orphan Home and School was built by the Crossley brothers at a great cost, and has an endowment of £135,894. In 1887 Mr J. Porter of Manchester (formerly of Halifax) augmented the endowment fund by a gift of £50,000. Halifax has four parks—Savile, Shrogg's, Akroyd, with free library, museum, and art-gallery, and the People's Park. The last, the gift of the late Sir F. Crossley (q.v.), is tastefully laid out from designs by Sir Joseph Paxton, and cost about £40,000. There are two theatres (one dating from 1888). The Public Libraries Act has been adopted; there are also a Mechanics' Institute and the Dean Clough Institute erected by the Crossleys for their work-people. There is a strong co-operative society (Halifax Industrial), with central stores erected in 1861 at a cost of £17,400, and twenty-eight branch stores.

The worsted and carpet trades are the staple industries. Crossley's carpet-works, the largest in the world, employ more than 5000 hands. The manufactured goods, other than carpets, are chiefly worsted coatings, fancy dress goods, damasks, and merinos. Cotton fabrics and woolcards are manufactured, while dyeing and hosiery trades are on an extensive scale. There is also some trade in corn; iron, chemicals, boots, and mill-machinery are manufactured, and freestone is quarried. The water-works, which are very complete, have cost the corporation about £675,000. Pop. (1851) 33,582; (1871) 65,510; (1881) 73,633; (1891) 82,864. The borough since 1832 has returned two members to parliament.

A strange old local law, relinquished in 1650, known as the Halifax Gibbet Law, was enacted here at an early period of the woollen manufacture, for the protection of the manufacturers against the thievish propensities of persons who stole the cloth when stretched all night on racks or wooden frames, called tenters, to dry. The Gibbet Law provided that all persons within a certain circuit, who had stolen property of or above the value of 13½d., were to be tried by the frith-burghers within the liberty; and, if found guilty, they were handed over to the magistrates for punishment, and were executed on the first market-day following by means of an instrument similar to the guillotine. See Watson's *History of Halifax* (1775; ed. by Leyland, 1869).

Halifax, the capital of Nova Scotia and the principal Atlantic seaport of Canada, is situated on the eastern or Atlantic coast of Nova Scotia, in 44° 39′ N. lat. and 63° 37′ W. long. It is the nearest to Great Britain of any city on the American continent, being but 2178 miles from Cape Clear. Previous to the founding of the city, the magnificent sheet of water that constitutes its

harbour was called by the Indians *Chebucto*, signifying the greatest of havens—a name not inappropriate for what is one of the finest harbours in the world. It is easily accessible at all seasons of the year, at all times of the tide, by ships of any tonnage; and is capable of affording safe anchorage to the whole British navy. The fact that it was selected as the American rendezvous of the ill-starred expedition of D'Anville against the British colonies in America in 1746 led to a demand on the part of those colonies that a place of such strategic importance should no longer be unoccupied by imperial troops. Their demand was ably supported by Lord Halifax, and accordingly an expedition was fitted out in 1749, under command of the Hon. Edward Cornwallis, which founded the city and gave to it the name of its English patron. It at once became the capital of the province, and the principal naval and military station of Great Britain in America, and has remained so ever since. It is garrisoned by imperial troops, and is strongly fortified—its supposed impregnability securing for it the appellation of 'the Cronstadt of America.' The dockyard, covering 14 acres, is one of the finest in the British colonies. Down to the close of the Napoleonic wars Halifax was little more than a military and naval *entrepôt;* but of late years it has assumed more and more the character of a commercial city. It is built on the western side of the harbour, and extends along it about two miles and a half. The streets are well laid out, and are lighted by electricity. The commercial portion of the city is built principally of freestone. Its water-supply is excellent, and statistics show it to be one of the healthiest cities in America. It is the residence of the Roman Catholic archbishop of Halifax (whose archiepiscopal see includes Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland) and of the Church of England bishop of Nova Scotia. It is also the seat of Dalhousie University and of a large number of other educational institutions, including a school for the blind, and one for the deaf and dumb. In common with the rest of the province, its public schools are free, and attendance at them between certain ages is compulsory. It is the eastern or Atlantic terminus of the Intercolonial Railway of Canada and of the Canadian Pacific Railway, and has lines of steamers connecting it with London, Liverpool, New York, Boston, Bermuda, the West Indies, St Pierre, and both the east and west coasts of Newfoundland. It has also the largest graving-dock (580 by 102 feet) in America, constructed in 1880–89, at a cost of $1,000,000, and capable of receiving the largest ship afloat. The proximity of Halifax to the coalfields of Pictou and Cape Breton and its extensive wharf accommodation make it a favourite coaling station for steamers navigating the North Atlantic. Its population in 1881 was 36,100; its population at the census of 1891 was 38,556. Dartmouth, on the opposite shore of the harbour—practically a suburb of Halifax—has a population of 6200. In an average year the foreign trade of the port amounts to $10,000,000 or $12,000,000. The total number of vessels entering and clearing the harbour is from 2000 to 3000, with a tonnage of 1,500,000 tons.

Halifax, CHARLES MONTAGU, EARL OF, poet and statesman, who owed his introduction to political power to his facile skill in verse-making, was the nephew of the famous Parliamentary general, the Earl of Manchester, and was born at Horton, in Northamptonshire, 16th April 1661. He was educated at Westminster School and Trinity College, Cambridge, where he formed a life-long friendship with Newton. His most notable poetical achievement was a parody on Dryden's *Hind and Panther*, entitled *The Town and Country Mouse* (1687), of which he was joint author with Matthew Prior; but his poetry would hardly have made his name remembered in the 19th century. In the following year, through the influence of the Earl of Dorset, he became member for Maldon in the Convention Parliament, and soon developed a decided talent for financial business. Retaining his seat in William III.'s first parliament, he was appointed in 1692 a Commissioner of the Treasury. On the 15th December of the following year he proposed, in the House of Commons, to raise a million sterling by way of loan. William required money for his wars; the moneyed classes were tired of bubble companies, and knew not where to invest safely; and the landowners were weary of heavy taxation: so the National Debt was established. In the spring of 1694 money was again wanted, and Montague supplied it by originating a national bank, a scheme for which had been laid before government by William Paterson, three years before. The capital was to be £1,200,000, and the shareholders were to be called the Governor and Company of the Bank of England. As a reward for this service Montague was appointed Chancellor of the Exchequer in 1694. His next work was the recoinage in 1695, which he carried out successfully, appointing Newton warden of the Mint, and raising a tax on windows to pay the expense, instead of the obnoxious impost called hearth-money. At this crisis too he first introduced exchequer bills. On Godolphin's resignation in 1697 he became premier, but his arrogance and vanity soon made him unpopular, and on the accession to power of the Tories in 1699 he was obliged to accept the auditorship of the exchequer, and withdraw from the Commons as Baron Halifax. He was impeached before the House of Lords for breach of trust in 1701, and again in 1703, but the proceedings fell to the ground. During the whole of Anne's reign Halifax remained out of office, but was active in promoting the union with Scotland, and the Hanoverian succession. On the queen's death he was appointed a member of the council of regency, and on George I.'s arrival became an earl and prime-minister. His rule lasted only nine months, being terminated by death on 19th May 1715.

Halifax, GEORGE SAVILE, MARQUIS OF, statesman, was born in the year 1633. For the share he took in bringing about the Restoration he was created a viscount in 1668. In 1675 he opposed Danby's Test Bill, and in 1679 by a display of extraordinary oratory procured the rejection of the Exclusion Bill. Three years later he was created a marquis, and made Lord Privy Seal. On the accession of James II. he became president of the council, but was dismissed in 1685 for his opposition to the repeal of the Test Act and the Habeas Corpus Act. He was one of the three commissioners appointed by James II. to treat with William of Orange after he landed in England. After the flight of James, Halifax tendered his allegiance to William III., and under him resumed the office of Lord Privy Seal; but, subsequently joining the opposition, he resigned his post in 1689. He died 20th April 1695. Shaftesbury was the sole rival as an orator of this

> [illegible] of piercing wit and pregnant thought,
> Endued by nature and by learning taught
> To move assemblies.—DRYDEN's [illegible]

As a minister he was a failure, owing to his frequent changes of side; yet he was not a fickle party-man, but rather a philosophic statesman, who, in order to serve his country, was compelled by the excesses of party to adopt this course—such at least is the defence he lays down in his *On the Character of a Trimmer*. The poet-musician Henry Carey (q.v.) is believed to have been his natural son. See his *Life and Letters*, by H. C. Foxcroft (1898).

Haliotis, a genus of gasteropodous molluscs, of the family Haliotidæ, order Prosobranchiata; shell widely open, ear-shaped, pierced on the outer margin by a series of holes which are closed in the course of growth after ceasing to be of use in containing the pallial folds. The shell, on account of its beautifully iridescent Nacre (q.v.), is much used for the purposes of ornament. In some parts of Italy it is called Venus's ear; it is the 'mother-of-pearl' of old English writers, and the 'ormer' (contracted from *oreille de mer*) of the French. The animal itself, in a living state, exhibits great beauty of colours. It inhabits the littoral zone, adhering to rocks like the limpet; one Japanese species, however, is found in deep water. Several species are used for food in different parts of the world. The genus has a wide distribution, being found in every part of the ocean from the Channel Islands southwards. Seventy-five recent and four fossil species, commencing in the Miocene period, are known.

Halitherium. See DUGONG.

Hall, the large principal apartment of the castles and mansions of the middle ages. The hall is of very ancient origin. The earliest Saxon buildings we have any record of are the palaces of the kings, and these seem to have consisted of one large hall, in which the king, his courtiers or 'hearth-men,' and all his retainers dwelt together, eating at the same table, and sitting round the same fire; and one other chamber, in which the king and his hearth-men slept, while his retainers slept in the hall. In the Norman keep the hall occupied the whole of the first floor—the private apartment of the lord of the castle being on the floor above. In the 12th century halls of a more commodious kind came to be erected in the courtyards of the castles, with the private apartments at one end and the kitchen offices at the other. The same arrangement prevailed, with slight modifications, during the 12th and 13th centuries. In the 14th and 15th centuries, when England was more settled and prosperous, and manners more refined, numerous apartments became necessary. The hall, however, still retained its place as the chief apartment. In it the king or the lord of the manor gave audience, administered justice, received and entertained his retainers and guests, and performed all the public acts of feudal life.

At one end of the hall was a raised platform or dais, on which the table of the lord of the manor was placed, and where his more honoured guests sat along with him. This end of the hall was usually lighted with large oriel windows, and communicated with a building which contained the lord's solar, or bedroom and parlour, on the upper floor, and the wine-cellar below. The retainers sat at a table which ran along the lower part of the hall. This part was not always in the cleanest and sweetest condition, and hence it received the name of 'the marsh.' The entrance porch was at the lower end of the hall, where also a passage was cut off by a screen. This passage gave access to the kitchen, pantry, and buttery, and above the passage a gallery for musicians was frequently constructed. Survivals of such medieval dining-halls may be found in the Oxford and Cambridge colleges, with their high tables, portraits, stained glass, &c., as also in the halls of the Inns of Court and of some of the London guilds.

The hall partook of the style of architecture prevailing at the time when it was built, and being a large and important apartment was generally ornamental in its character. The roofs especially were very carefully and elegantly constructed, as many still remaining show. The hall was essentially a part of feudal architecture. When that system gave way, the large common halls were abandoned and private dining-rooms substituted. Many old ones, however, still remain; but their use is changed. The hall of the king's palace, now called 'Westminster Hall,' built by William Rufus, and restored by Richard II., is the finest example in England, being 300 feet long and 100 feet broad. See also MUNICIPAL ARCHITECTURE.

Hall, or SCHWÄBISCH-HALL, a town of Würtemberg, is beautifully situated in the deep valley of the Kocher, 33 miles by rail E. by S. of Heilbronn. Like other places in whose names the word Hall or Salz occurs, Hall has considerable saltworks, the brine being obtained from Wilhelmsglück, 5 miles distant, and producing annually nearly 80,000 cwt. of salt. There are also cotton-spinning and weaving, silk and machine manufactures, and tanneries. The Gothic church of St Michael (1427–1525) has excellent wood-carvings. In 1276 Hall was made a free imperial town; it had enjoyed since 1228 the right of minting money; here were coined the first silver *heller* (*häller*) or farthings. In 1802 it was added to Würtemberg. Pop. 9125.

Hall, a town of Austria, in Tyrol, is situated on the Inn, 6 miles by rail E. of Innsbruck. The parish church contains a monument to Speckbacher, the Tyrolese patriot of 1809. About 7 miles north of the town is the Salzberg, from the mines in which salt brine is conveyed to the pans of Hall in wooden pipes. Here 150,000 cwt. of salt are produced annually. Hall received town rights in 1303. It is a health-resort. Pop. 5756.

Hall, BASIL, writer of travels and miscellaneous works, was born in Edinburgh, 31st December 1788. He was the son of Sir James Hall of Dunglass, baronet (1761–1832), the founder of experimental geology (see GEOLOGY), also distinguished as a chemist and as author of a work on Gothic architecture. Basil entered the navy in 1802, and became post-captain in 1817. When Lord Amherst was sent on a mission to the court of Peking in 1816, Hall commanded a sloop in the naval escort, and visited some places along the western coast of the Corea which were little known to Europeans. The chief results of his explorations were published in *A Voyage of Discovery to Corea and the Great Loo-Choo Islands* (1818), a book which took the popular fancy. After this he wrote *Extracts from a Journal written on the Coast of Chili, Peru, and Mexico in 1820–22; Travels in North America in 1827–28* (a work that was violently assailed by the American press); and, also popular, *Fragments of Voyages and Travels* (9 vols. 1831–40). *Hainfeld* (1836), a semi-romance, and *Patchwork* (1841), a collection of tales and sketches, also came from his pen. He was a Fellow of the Royal Societies of London and Edinburgh, and a member of the Astronomical Society of London, and the author of various articles in the scientific journals of the day. He died insane in Haslar Hospital, Gosport, 11th September 1844.

Hall, CHARLES FRANCIS, Arctic explorer, born in Rochester, New Hampshire, in 1821, was successively a blacksmith, journalist, stationer, and engraver, and, becoming interested in the fate of the Franklin expedition, devoted his leisure to gathering information about Arctic America. He made two search expeditions, in 1860–62 and 1864–69, living alone among the Eskimo, and bringing back some relics and the bones of one of Franklin's company; and in 1871 he sailed in command of the government ship *Polaris*, on an 'expedition to the North Pole.' He took his vessel for 250 miles up the channel leading from Smith's Sound, and on 29th August reached 82° 16′ N.—at that date the highest northern latitude ever reached;

then turning southward, he went into winter-quarters at Thank God Harbour, Greenland (81° 38′ N.). Here, on his return from a sledge expedition to the north, he was taken suddenly ill, and died 8th November 1871; over his grave a grateful epitaph was placed by the British polar expedition in 1876. His companions left Thank God Harbour in August 1872. In October, through the ice-anchor slipping, nineteen men were left with stores on a floe, and only after severe sufferings were they rescued by a sealer off the Labrador coast in the following April. The leaking *Polaris* was beached on Littleton's Island, and in June 1873 the party set out for Upernivik in two boats which they had constructed; they were ultimately picked up by a Dundee whaler near Cape York. The charts published by the expedition are often incorrect and misleading, but among the valuable results of Hall's work were the exploration of the West Greenland channel, and the extension of Greenland and Grinnell Land a degree and a half north. Hall published *Arctic Researches, and Life among the Esquimaux* (1864); and from his papers largely was compiled the *Narrative of the Second Arctic Expedition* (Washington, 1879).

Hall, Chester Moor (1703–71), a gentleman of Essex who in 1733 anticipated Dollond in the invention of the achromatic Telescope (q.v.).

Hall, Christopher Newman, Congregational minister, was the son of John Vine Hall, author of *The Sinner's Friend*, and was born at Maidstone on 22d May 1816. Having graduated at London University, he preached in Hull 1842–54, and then removing to London, was till 1892 minister of Surrey Chapel or Christchurch, Lambeth, which was originally founded by Rowland Hill. He enjoyed wide repute as an eloquent and popular preacher, and is the author of several works of a devotional character, some of which, as *Come to Jesus*, *The Call of the Master*, and *The Man Christ Jesus*, have had an enormous sale. He has also written *Antidote to Fear*, *Meditations on the Lord's Prayer*, *Pilgrim Songs*, *In Cloud and Sunshine*, &c. See his *Autobiography* (1898).

Hall, or **Halle,** Edward, English historian, was born in London in 1499, of a family settled in Shropshire, but of German descent. He was educated at Eton, became scholar of King's College, Cambridge, in 1514, and junior Fellow in due course, next studied at Gray's Inn, and heard some of the lectures of Wolsey's foundation at Oxford. He became one of the common serjeants and undersheriff of the city of London, and afterwards a judge in the sheriff-court, and died in 1547, in the same year with Henry VIII. Next year his history was printed from his manuscript by Richard Grafton, under the title, *The Union of the Two Noble Families of Lancaster and Yorke*. It was composed mostly in his younger years, but was only brought down to 1532; the rest, down to 1546, was completed by Grafton. The exceptionally large number of variations in the copies make this thick black-letter folio something of a bibliographical curiosity.

Hall's work is one of the finest of our early histories, and the stately dignity of its style and reality of its figures had a charm for the dramatic sense of Shakespeare. To the student of the reign of Henry VIII. it is especially valuable as the truthful and intelligent evidence of an eye-witness, and if his account of his king is too uniformly eulogistic, we must remember how inestimably valuable to his legal mind was the present blessing of a settled domestic peace after the bloodshed and distraction of the Roses. Hall loves to describe with detail scenes of pomp and pageantry, such as made splendid the early years of Henry's reign—a taste that harmonises well with the stately and pompous Latinisms of his English. The best edition is that by Sir Henry Ellis (1809).

Hall, James, LL.D., geologist, was born at Hingham, Massachusetts, 12th September 1811, and in 1837 was appointed one of the New York state geologists. His final report on the western part of the state appeared in 1843. Of his other works the chief is his important *Palæontology of New York* (vols. i.–v. 1847–79); he also contributed to the geological surveys of Iowa, Wisconsin, and Canada, and published nearly 250 separate papers. A member of numerous scientific bodies, he died 7th August 1896.

Hall, Joseph, bishop and divine, was born 1st July 1574, at Ashby-de-la-Zouch, Leicestershire. He was educated at Emmanuel College, Cambridge, of which he became a Fellow in 1595. Taking orders, he held successively the livings of Halstead and Waltham, in Essex, and the deanery of Worcester. In 1617 he accompanied James to Scotland to help establish Episcopacy, and in this and the next year was one of the English deputies to the synod of Dort. He was consecrated Bishop of Exeter in 1627, and in 1641 was translated to Norwich. The later years of his life were saddened by persecution. He was accused of Puritanism, though he zealously defended Episcopacy, and he incurred the enmity of Archbishop Laud. In 1641, having joined the prelates who protested against the validity of all laws passed during their enforced absence from parliament, he was committed to the Tower, and threatened with a prosecution for high-treason, but was set at liberty at the end of seven months, on finding bail for £5000. Shortly after his return to Norwich his revenues were sequestrated and his property pillaged. Thereafter he rented a small farm at Higham, near Norwich, to which he retired in 1647. There he died 8th September 1656. His works, including *Contemplations*, *Christian Meditations*, *Episcopacy*, and *Mundus Alter et Idem*, a Latin satirical romance of an unknown country in Terra Australis, were edited by the Rev. Josiah Pratt (10 vols. 1808), and by Peter Hall, a descendant (12 vols. 1837–39). His poetical *Satires: Virgidemiarum* (1597–98) Pope calls 'the best poetry and the truest satire in the English language.' Hallam, however, accuses him of being harsh and rugged, obscure, and ungrammatical. See Life by George Lewis (1886).

Hall, Marshall, physician and physiologist, the son of Robert Hall, who introduced the practice of bleaching cotton with chlorine, was born at Basford, in Nottinghamshire, 18th February 1790. After studying medicine at Edinburgh (1809–14), Paris, Göttingen, and Berlin, he settled at Nottingham in 1817; and practised in London from 1826 until 1853. He died at Brighton, 11th August 1857. Though not the original observer of the phenomena of the reflex action of the spinal system, Hall claims to have been the first to show their independence of sensation, to work out the laws of their causation, and to apply the knowledge of them to the comprehension of nervous diseases. His investigations on this subject were published in two papers (1833–37). His name is also associated with a well-known method of restoring suspended respiration (see Respiration, Artificial). Besides the above-mentioned papers, he wrote several works on diagnosis (1817), the circulation (1831), *The Inverse Ratio between Respiration and Irritability in the Animal Kingdom* (1832), and on the nervous system and its diseases. A bibliography will be found in *Memoirs of Marshall Hall*, by his widow (1861).

Hall, Robert, dissenting preacher and writer, was born at Arnsby, near Leicester, May 2, 1764.

Feeble in body but precocious in intellect, he learned to read before he could speak. He was educated at a Baptist academy at Bristol (1778–81), and at King's College, Aberdeen (1781–85), where he formed an intimate companionship with (Sir James) Mackintosh. Immediately after his graduation he was appointed assistant minister and tutor in the academy at Bristol. Here his eloquent preaching attracted overflowing audiences. As an orator he was fluent, rapid, and impressive, and was liberal, but not heterodox, in his religious views. In consequence of a disagreement with his colleague, he went in 1790 to Cambridge, where by his powerful and vivid eloquence he rose to the highest rank of British pulpit orators. His writings, apart from sermons, are few; the more important are an *Apology for the Freedom of the Press* (1793) and *On Terms of Communion* (1815). In 1806 he settled in Leicester; but returned in 1826 to Bristol, where he died February 21, 1831. A complete edition of his works, with a memoir by Dr O. Gregory, and Observations on his Preaching by John Foster, was published at London (6 vols. 1831–33; 11th ed. 1853).

Hall, Samuel Carter, author and editor, fourth son of Colonel Robert Hall, was born at Geneva Barracks, County Waterford, 9th May 1800. Coming to London from Ireland in 1822, he studied law, and became a gallery reporter for the *New Times*. He established the *Amulet* (1825), an annual, which he edited for several years; succeeded the poet Campbell as editor of the *New Monthly Magazine;* was sub-editor of the *John Bull;* and did other journalistic work before he founded and edited the *Art Journal* (1839–80), which has done so much to create a public for art. He was a pertinacious and indefatigable worker and skilful compiler, the joint works written and edited by Mr and Mrs S. C. Hall exceeding 500 volumes. Amongst these were *Ireland, its Scenery,* &c. (illus. 1841–43); *The Book of Gems; British Ballads,* one of the fine-art books of the century; and *Baronial Halls.* A testimonial of £1600 was presented to him by friends in 1874, and in 1880 he received a civil-list pension of £150 a year. He died 16th March 1889. During his lifetime he had associated with most of the best men and women of his time, and showed a benevolent and helpful disposition. See his *Retrospect of a Long Life* (2 vols. 1883), and Mrs Mayo's 'Recollections of Two Old Friends' (*Leisure Hour*, May 1889).

Mrs S. C. Hall (Anna Maria Fielding), novelist, and wife of the preceding, was born in Dublin on 6th January 1800. She was brought up by her widowed mother at Graige, on the coast of Wexford, and in her fifteenth year came to London, where her education was completed. In 1824 she married Samuel Carter Hall, who encouraged her to write, and was her guide and counsellor in the composition of her tales and novels, which owed much to his pruning and polishing. She possessed, however, a genuine and spontaneous literary gift. Her first work, *Sketches of Irish Character* (1828), established her reputation. She wrote nine novels, and hundreds of shorter stories, including *The Buccaneer* (1832); *Tales of Woman's Trials* (1834); *The Outlaw* (1835); *The French Refugee*, a drama, which in 1836 was acted for about fifty nights at the St James's Theatre, London; *Uncle Horace* (1837); *Lights and Shadows of Irish Character* (1838); *Marian* (1839); *Midsummer Eve* (1843); *The Whiteboy* (1845), &c. Her *Stories of the Irish Peasantry* appeared originally in *Chambers's Journal*. Besides assisting her husband in various works, and by contributions to the *Art Journal*, she furnished numerous articles to periodicals, edited the *St James's Magazine* for a year, and wrote various books for the young. Of these *Uncle Sam's Money-box* is one of the best. She assisted in the formation of the Governesses' Benevolent Institution, a hospital for consumptives, and the Nightingale Fund, which resulted in the endowment of a training-school for nurses. Mrs Hall died January 30, 1881.

Hallam, Henry (1777–1859), historian, son of John Hallam, Canon of Windsor and Dean of Bristol, was born at the former town, 9th July 1777. He studied at Eton College with zeal and success (his Latin verses in the *Musæ Etonenses* were esteemed by competent judges among the best in the collection). He matriculated at Christ Church, Oxford, 20th April 1795, and proceeded B.A. 1799, M.A. 1832. The modern system of prizes was not yet in existence, and if he did nothing tangible at the university, it was because there was nothing to be done. Certainly all through he worked strenuously. He next read law in chambers in Lincoln's Inn, was admitted a member of the Middle Temple, and called to the bar by that society in 1802. His inn elected him a bencher in 1841, a somewhat rare honour for a non-practising barrister, as Hallam from the first gave himself entirely to literary pursuits. He had a small but sufficient fortune of his own, whilst his Whig friends in due time gave him various appointments—a commissionership of stamps among the rest. In 1805 he was engaged to write for the *Edinburgh Review* (Byron's famous satire alludes to him as 'classic Hallam, much renowned for Greek'), but it was not till he was over forty that he published his first great work. This was his *View of Europe during the Middle Ages.* It at once gave him a foremost place among English historians. He received in full measure such honours as fall to the lot of successful scholars. He was created a D.C.L., and elected a Fellow of the Royal, the Antiquarian, and many other learned societies at home and abroad. He was also a trustee of the British Museum, in which institution he took a great interest.

His life was almost without external incident. Its course was narrow and retired, yet within it he was both singularly fortunate and unfortunate. He had no money cares, he chose his own path in literature, and its very drudgery was delightful to him. He was fond of travel and of the society of cultivated men, and he enjoyed both. He was universally respected and admired. He had married a daughter of Sir Abraham Elton of Clevedon Court, Somersetshire, and the marriage was a happy one. He was devotedly attached to his wife and children; but there was some strain of physical weakness in the family. Of many children, only four survived early life. One of them died suddenly at Vienna. He was the Arthur Henry Hallam (1811–33) of *In Memoriam.* That work, rather than the fragments he left, full of promise as these were, will preserve his name. Hallam felt the loss keenly. He spoke of himself as one 'whose hopes on this side the tomb are broken down for ever;' but fate had not exhausted its malice. His wife died in 1840. The younger son, Henry Fitzmaurice Hallam (1824–50), was struck down abroad like his brother. A sister had predeceased him. The father lived on for yet nine years. In the shadowy joys of literature he found some consolation for those deep pangs which learned and unlearned feel with equal anguish. One daughter, wife to Colonel Cator of Pickhurst, in Kent, remained to soothe with pious care his last years. He lived with her till his death, 21st January 1859. He was buried with his wife and children in Clevedon Church, 'in a still and sequestered situation on a bare hill that overhangs the Bristol Channel.' A statue by M. Theed was erected to him in St Paul's Cathedral in 1862.

Hallam's position as an historian rests upon three great works. (1) *View of the State of Europe during*

the Middle Ages (2 vols. 1818), the object of which is 'to exhibit in a series of historical dissertations a comprehensive survey of the chief circumstances that can interest a philosophical inquirer during the period usually denominated the middle ages.' Special attention is accordingly given to the modes of government and constitutional laws. (2) *The Constitutional History of England from the Accession of Henry VII. to the Death of George II.* (2 vols. 1827). The starting-point is so fixed, because Hallam had already discussed the antecedent portion in the eighth chapter of his *View of the State of Europe*. He did not go further, 'being influenced by unwillingness to excite the prejudices of modern politics.' This did not save him from a savage attack by Southey in the *Quarterly Review*. Macaulay made the book the subject of a brilliant panegyric in his well-known Essay. The work has survived both praise and blame. It is still the standard authority for the period over which it extends; the preceding period was treated by Stubbs; the subsequent, by Sir T. E. May. (3) *Introduction to the Literature of Europe in the Fifteenth, Sixteenth, and Seventeenth Centuries* (4 vols. 1837–39). This exhibits an even greater range of information than Hallam's other works; but its extent prevented it from being so thorough as they are. The sources are not so original, and it is not of such permanent value as the *Constitutional History*. Neither extracts nor biographical details are given, but full analyses of the works discussed.

Hallam's scholarship is accurate, his learning is both wide and deep. He is perfectly honest and perfectly disinterested. He is very anxious to find out the truth and impart it to the reader; and his style is clear and correct. He had some defects. He was a Whig of the old school (he was keenly opposed to the first Reform Bill), and disposed to look at everything from a somewhat narrow party point of view. There is a want of colour and animation about his style, and there is little human interest in his work; he dissects the past, but he does not make it live again for his readers. He is an author 'rather praised than read,' or at least his works are rather consulted by the student than popular with the general reader. Possibly this is the fate he would himself have wished for them.

There is oddly enough no complete Life of Hallam. The best accounts are the obituary and funeral notices in the *Times*, 24th and 31st January 1859, and in the *Proceedings of the Royal Society of London* (vol. x. p. 12, 1859–60). See also Harriet Martineau's *Biographical Sketches*. *The Remains of Arthur Henry Hallam*, with a memoir by his father, appeared in 1834, and a brief notice of Henry Fitzmaurice Hallam was printed soon after his death. Editions, translations, and abridgments of Hallam's works are numerous.

Hallamshire, an ancient manor of the West Riding of Yorkshire, with Sheffield for its capital. It now gives name to a parliamentary division.

Halle, a city of Prussian Saxony, known as Halle an der Saale, to distinguish it from other places of the same name in Germany, is situated on the right bank of the Saale and on several small islands of the river, 20 miles by rail NW. of Leipzig. As an important railway centre, Halle has of late years rapidly increased in size, industry, and prosperity. Its famous university was founded in 1694 by Frederick I. of Prussia; after having been suppressed by Napoleon in 1806, and again in 1813, it was re-established in 1815 and incorporated with the university of Wittenberg, which had been dissolved during the war. At first a chief seat of the pietistic school of theology, Halle subsequently became the headquarters of the rationalistic and critical schools. In 1888 the university was attended by 1501 students, and had 116 professors and lecturers. The Francke Institutions rank amongst the most important establishments of the place (see FRANCKE). The noteworthy buildings and institutions embrace St Mary's church (1529–54); the Gothic church of St Maurice, dating from the 12th century, with fine wood-carvings and sculptures; the red tower 276 feet high, in the market-place, with a Roland statue in front of it; the town-hall; the remains of the Moritzburg, built in 1484, the ancient residence of the archbishops of Magdeburg; a deaconesses' home; a large penitentiary; the medical institutes and clinical hospitals; the agricultural institute; the university library (220,000 vols.); a provincial museum; an art collection; and an archæological and other museums. The most important industrial product of Halle is salt, obtained from brine-springs within and near the town, which have been worked from before the 7th century, and still yield about 114,500 cwt. annually. The men employed at the salt-springs, and known as 'Halloren,' are a distinct race, supposed by some to be of Wendish and by others of Celtic descent, who have retained numerous ancient and characteristic peculiarities. The industries next in importance after the salt-manufacture are machine-making, sugar-refining, printing, brewing, the manufacture of mineral oil, and fruit cultivation. A very active trade is carried on in machines, raw sugar, mineral oil, grain, and flour. Halle is the birthplace of Handel the composer. Pop. (1871) 52,639; (1880) 71,484; (1885) 81,949; (1891) 101,401.

Halle, originally a border fortress against the Slavs, became in the 10th century an appanage of the Archbishop of Magdeburg, and by the 12th century was famous as a commercial city. In that and the 13th century Halle was a powerful member of the Hanseatic League, and successfully withstood a fierce siege by the Archbishop of Magdeburg in 1435, but finally fell into his hands in 1478. Terribly impoverished during the Thirty Years' War, it was incorporated with Brandenburg at the peace of Westphalia. See works by Von Hagen (1866–67), Voss (1874), and Schönermark (1886).

Halle, ADAM DE LA. See DRAMA.

Hallé, SIR CHARLES, an eminent pianist, was born at Hagen, in Westphalia, 11th April 1819. He studied first at Darmstadt, and from 1840 at Paris, where his reputation was established by his concerts of classical music. But the revolution of 1848 drove him to England, and he ultimately settled in Manchester. He and his highly-trained orchestra were ere long familiar to the music lovers of the kingdom from London to Aberdeen. He did much to raise the popular standard of musical taste by familiarising the British public with the great classical masters. An LL.D. of Edinburgh (1884), and knighted in 1888, he died 25th October 1895. See his *Life and Letters* (1896). LADY HALLÉ (*née* Wilhelmine Neruda), violinist, was born at Brünn in Moravia, 29th March 1839. An organist's daughter, she made her début at Vienna in 1846, and three years later played first in London at the Philharmonic. She married in 1864 the Swedish musician Normann, and, after his death in 1885, Sir Charles Hallé.

Halleck, FITZ-GREENE, an American poet, born at Guilford, Connecticut, July 8, 1790. By his mother he was descended from John Eliot, 'the apostle of the Indians.' He became a clerk in a bank in New York in 1811, and in 1832 the private secretary of John Jacob Astor; in 1849 he retired, on an annuity of $200 left him by Astor, to his native town, where he spent the remainder of his days, and died November 19, 1867. From his boyhood Halleck wrote verses, and in 1819 he contributed, with Joseph Rodman Drake, a series of humorous satirical papers in verse to

the New York *Evening Post*. In the same year he published his longest poem, *Fanny* (2d ed., enlarged, 1821), a satire on the literature, fashions, and politics of the time, in the measure of *Don Juan*. He visited Europe in 1822, and in 1827 published anonymously an edition of his poems (3d ed., enlarged, 1845). In 1865 he published *Young America*, a poem of three hundred lines. His complete *Poetical Writings* have been edited by his biographer (1869). Halleck is a fair poet. His style is spirited, flowing, graceful, and harmonious. His poems display much geniality and tender feeling. Their humour is quaint and pungent, and if not rich, is always refined. See his *Life and Letters*, edited by James Grant Wilson (1869).

Halleck, Henry Wager, an American general, was born at Westernville, New York, 16th January 1815, and graduated at West Point in 1839. During the Mexican war he was employed in the operations on the Pacific coast, and for his gallant services was breveted captain in 1847. He took a leading part in organising the state of California, became captain of engineers in 1853, left the service in 1854, and for some time practised law in San Francisco. On the outbreak of the civil war he was commissioned major-general in the regular army, and in November 1861 was appointed commander of the department of the Missouri, which in a few weeks he reduced to order. In March 1862 the Confederate first line had been carried from end to end, and Halleck's command was extended so as to embrace, under the name of the department of the Mississippi, the vast stretch of territory between the Rocky Mountains and the Alleghanies. His services in the field ended with the capture of Corinth, with its fifteen miles of intrenchments, in May 1862. In July he became general-in-chief of all the armies of the United States; and henceforth he directed from Washington the movements of the generals in the field, until, in March 1864, he was superseded by General Grant. Halleck was chief of staff until 1865, commanded the military division of the Pacific until 1869, and that of the South until his death, 9th January 1872. His *Elements of Military Art and Science* (1846; new ed. 1861) was much used during the civil war; and he also published books on mining laws, &c.

Hälleflinta (Swedish), a very hard compact rock, yellow, red, brown, green, gray, or black. It is composed of an intimate mixture of siliceous and felspathic matter, with occasionally scales of chlorite or mica. In hand-specimens it might be readily mistaken for a compact felsite, but in good sections in the field it generally occurs in thin beds and bands. It appears to be a metamorphic rock —in some cases an altered volcanic mud.

Hallein, a town of Austria, 10 miles S. of Salzburg, is noted for its salt-works and saline baths. Salt is made to the amount of 220,000 cwt. annually. Pop. 3927.

Hallelujah, or Alleluia (Heb., 'Praise ye Jehovah'), one of the forms of doxology used in the ancient church, derived from the Old Testament, and retained, even in the Greek and Latin liturgies, in the original Hebrew. The singing of the doxology in this form dates from the very earliest times; but considerable diversity has prevailed in different churches and at different periods as to the time of using it. In general it may be said that, being in its own nature a canticle of gladness and triumph, it was not used in the penitential seasons, nor in services set apart for occasions of sorrow or humiliation. In the time of St Augustine the hallelujah was universally used only from the feast of Easter to that of Pentecost; but a century afterwards it had become the rule in the West to intermit its use only during the season of Lent and Advent, and on the vigils of the principal festivals. In the Roman Catholic Church this usage is followed.

Haller, Albrecht von, anatomist, botanist, physiologist, and poet, was born at Bern, 16th October 1708. He was a sickly but remarkably precocious child. After a severe course of study, at Tübingen, Leyden (where he graduated in 1727), London, Paris, Oxford, and Basel, he settled down to practise as a physician at Bern in 1729. There, in the course of seven years, his botanical researches, especially on the flora of Switzerland, and his anatomical investigations, spread his fame through Europe, and led to his being called (1736) to fill the chair of Medicine, Anatomy, Botany, and Surgery at the newly-founded university of Göttingen. Here he organised a botanical garden, an anatomical museum and theatre, and an obstetrical school; helped to found the Göttingen Royal Academy of Sciences; wrote a great number of anatomical and physiological works; took an active part in the literary movement which culminated in the golden age of Goethe and Schiller; and interested himself in nearly all the questions of the day. In 1753 this many-sided man resigned his offices and dignities at Göttingen and returned to his beloved Bern, where the rest of his life was spent, his energies being principally occupied with the duties of 'amman' or magistrate. Nevertheless he found time to write three political romances, and to prepare four large works on the bibliography connected with botany, anatomy, surgery, and medicine. Critics of the standing of Vilmar name him first among the regenerators of German poetry, and give him the credit of beginning the new epoch. His poems were descriptive, didactic, and (the best of them) lyrical. Haller died at Bern, 12th December 1777. His name is particularly connected with muscular irritability, the circulation of the blood, and numerous excellent descriptions, of an anatomico-physiological character, of important parts of the human body. Of his voluminous writings the chief were *Icones Anatomicæ* (1743-50), *Opuscula Anatomica Minora* (1762-68), *Disputationes Anatomicæ Selectiores* (1746-52), *Elementa Physiologæ Corporis Humani* (1757-66), *De Respiratione* (1746-49), *De Functionibus Corporis Humani Præcipuarum Partium* (1777-78), *Opuscula Pathologica* (1755), *Enumeratio Stirpium Helveticarum* (1742), *Opuscula Botanica* (1749), and *Gedichte* (1732; new ed. 1882). See Lives by Blösch and Hirzel (1877) and Frey (1879).

Halley, Edmund, astronomer and mathematician, was born at Haggerston, near London, 29th October 1656, educated at St Paul's School, and afterwards at Queen's College, Oxford, which he entered in 1673. Before leaving school he became an experimenter in physics, and noticed the variation of the compass. In 1676 he published a paper (in *Philosophical Transactions*) on the orbits of the principal planets, also observations on a spot on the sun, from which he inferred the sun's rotation on its axis. In November of the same year he went to St Helena, where he applied himself to the formation of a catalogue of the stars in the southern hemisphere, which he published in 1679 (*Catalogus Stellarum Australium*). Soon after his election as a Fellow of the Royal Society, he was deputed by that body to go to Danzig (1679) to settle a controversy between Hooke and Helvetius respecting the proper glasses for astronomical observations. In 1680 he was again on the Continent; with Cassini at Paris he made observations on the great comet which goes by his name (see Comet), and the return of which

he predicted. After his return to England he published in 1683 (*Phil. Trans.*) his theory of the variation of the magnet. The next year he made the acquaintance of Newton—the occasion being his desire to find a test of a conjecture which he had made, that the centripetal force in the solar system was one varying inversely as the square of the distance. He found that Newton had anticipated him, both in conjecturing and in demonstrating this fact. For an account of Halley's connection with the publication of the *Principia*, see NEWTON. In 1686 Halley published an account of the trade-winds and monsoons on seas near and between the tropics. Two years later he undertook a long ocean voyage for the purpose of testing his theory of the magnetic variation of the compass, and embodied the results of his observations in a chart (1701). In the following year he surveyed the coasts of the English Channel, and made a chart of its tides. In 1703 he was appointed Savilian professor of Geometry at Oxford, and two years later published his researches on the orbits of the comets. On the death of Sir Hans Sloane he became (1713) secretary of the Royal Society, and held that position until 1721. During this period he made valuable experiments with the diving-bell (see DIVING). In 1720, after the death of Flamsteed, he became astronomer-royal, and his last years he spent in observing the moon through a revolution of her nodes. He died at Greenwich, 14th January 1742. His *Tabulæ Astronomicæ* did not appear till 1749. Among his principal astronomical discoveries may be mentioned that of the long inequality of Jupiter and Saturn, and that of the slow acceleration of the moon's mean motion. He has the honour of having been the first who predicted the return of a comet, and also of having recommended the observation of the transits of Venus with a view to determining the sun's parallax—a method of ascertaining the parallax first suggested by James Gregory.

Halliwell-Phillipps, JAMES ORCHARD, a great Shakespearian scholar and antiquary, was born at Chelsea in 1820, the son of Thomas Halliwell. He studied at Jesus College, Cambridge, and, yet an undergraduate, began that long career as an editor which he kept up almost till the close of life. His studies embraced the whole field of our earlier literature, plays, ballads, popular rhymes and folklore, chap-books, and English dialects, and its fruits remain in the publications of the old Shakespeare and Percy societies. As early as 1839 he was elected Fellow of the Royal and Antiquarian societies. Gradually he came to concentrate himself upon Shakespeare alone, and more particularly upon the facts of his life, the successive editions of his *Outlines of the Life of Shakespeare* (1848; 8th ed. 1889) recording the growing results of his discoveries. For many years he waged a brave warfare with fortune, but in 1872 he took over the management of the property his wife (died 1879) inherited from her father, Thomas Phillipps, and assumed his father-in-law's name. In his quaint house at Hollingbury Copse near Brighton he accumulated an unrivalled collection of Shakespearian books, MSS., and rarities of every kind, and dispensing hospitalities to scholarly visitors from all parts of England and America, as well as giving princely benefactions of books to Edinburgh University, Stratford, and Birmingham. Here he died, January 3, 1889. The privately printed *Calendar* (1887) of his collection embraced as many as 804 different items. By his will it was first offered, at the price of £7000, to the corporation of Birmingham; but it was not accepted. Apart from Shakespeare, his *Nursery Rhymes and Nursery Tales of England* (1845) and *Dictionary of Archaic and Provincial Words* (1847; 6th ed. 1868) will keep his name from being forgotten. His magnificent edition in folio of the *Works of Shakespeare* (16 vols. 1853–65) was published at a price prohibitive to most students.

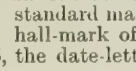
Hall-marks, or PLATE-MARKS, are authorised legal impressions made on articles of gold and silver at the various assay offices in the United Kingdom for the purpose of indicating to the public the true value and fineness of the metal of which they are composed. The marks are a series of symbols, which are stamped in an embossed style extending in a line of about one-half to three-quarters of an inch in length, the size of the marks varying with that of the articles on which they are impressed. They are usually stamped on every separate piece that is used to compose or make up an article. These symbols have the following representation: (1) The maker's mark, which is the initials of his Christian and surname, used since 1739. (2) The standard or Her Majesty's mark—viz. for gold of 22 carats, a crown and 22; for gold of 18 carats, a crown and 18; for gold of 15 carats, 15 and ·625; for gold of 12 carats, 12 and ·5; and for gold of 9 carats, 9 and ·375. These standard marks represent England; they are different for Scotland and Ireland. In the Edinburgh assay office the marks are: for gold of 22 carats, a thistle and 22; for gold of 18 carats, a thistle and 18; for gold of 15 carats, 15; for gold of 12 carats, 12; and for gold of 9 carats, 9. For Glasgow they are: for gold of 22 carats, a lion rampant and 22; for gold of 18 carats, a lion rampant and 18; for gold of 15 carats, a lion rampant and 15; for gold of 12 carats, a lion rampant and 12; and for gold of 9 carats, a lion rampant and 9. For Ireland the standard marks are: for gold of 22 carats, a harp crowned and 22; for gold of 20 carats—extra standard for Ireland only—a plume of feathers and 20; for gold of 18 carats, a unicorn's head and 18; for gold of 15 carats, 15 and ·625; for gold of 12 carats, 12 and ·5; and for gold of 9 carats, 9 and ·375. For England the silver standard marks are a lion passant for metal composed of 11 oz. 2 dwt. of fine silver to 18 dwt. of alloy, and Britannia for 11 oz. 10 dwt. fine silver to 10 dwt. alloy. For Scotland, a thistle for 11 oz. 2 dwt., and a thistle and Britannia for 11 oz. 10 dwt. at the Edinburgh assay office; and a lion rampant for 11 oz. 2 dwt., and a lion rampant and Britannia for 11 oz. 10 dwt. at the Glasgow assay office. For Ireland, a crowned harp for 11 oz. 2 dwt. No new standard of 11 oz. 10 dwt. is assayed and marked in Ireland. The figures in the gold standards denote the number of carats fine there are in any article bearing them, pure gold being reckoned at 24 carats; so that if a piece of gold-plate or jewelry is marked with a crown and 18 it indicates that it consists of 18 parts of pure gold and 6 parts of some other and inferior metal. This alloy would consist of three-fourths gold and one-fourth alloy. Gold as low in fineness as 9 carats is now legal, and as it is marked by the assay authorities there can be no deception if the public rightly understand the hall-marks introduced for their benefit. If they do not, then they are likely to be deceived. Nine-carat gold is a little over one-third pure gold. (3) The hall-mark of the assay towns: London, a leopard's head; Birmingham, an anchor; Chester, a dagger and three wheat sheaves; Sheffield, a crown; Newcastle, three castles; Exeter, a castle with three towers; Edinburgh, a castle; Glasgow, a tree, fish, and bell; Dublin, Hibernia. (4) The duty mark: the Queen's head, or head of the reigning sovereign, introduced in the year 1784. (5) The date mark: each assay office has now its letter or date mark, changed every year; 20 to 26 letters of the alphabet being used in rotation, and repeated in different styles of

letter. In London the assay year commences on the 30th May, and is indicated by one of twenty letters of the alphabet, A to U, omitting the letter J. The question has been raised whether the hall-marking system ought not to be discontinued.

The following table (made up from Cripps) shows specimens of the different alphabets used by the Goldsmiths' Company of London as date-letters from 1478; variety in the shape of the shields being also used as a further distinction:

1478 to 1498—Lombardic, caps., double cusps.	1696 to 1716—Court hand.
1498 to 1518—Black letter, small.	1716 to 1736—Roman, capitals.
1518 to 1538—Lombardic, capitals.	1736 to 1756—Roman, small.
1538 to 1558—Roman and other caps.	1756 to 1776—Black letter, capitals.
1558 to 1578—Black letter, small.	1776 to 1796—Roman, small.
1578 to 1598—Roman, capitals.	1796 to 1816—Roman, capitals.
1598 to 1618—Lombardic, capitals, external cusps.	1816 to 1836 Roman, small.
1618 to 1638—Italian, small.	1836 to 1856—Black letter, capitals.
1638 to 1658—Court hand.	1856 to 1876—Black letter, small.
1658 to 1678—Black letter, capitals.	1876 to 1896—Roman, capitals.
1678 to 1696—Black letter, small.	1896 to 1916—Roman, small.

The accompanying figure shows a Birmingham silver plate-mark. 1, the maker's initials; 2, the standard mark; 3, the hall-mark of Birmingham; 4, the duty-mark; 5, the date-letter for the year 1889.



See Cripps, *Old English Plate, its Makers and Marks* (1878; new ed. 1889); and Gee, *The Hall-marking of Jewellery practically considered* (1889).

Halloween, the name popularly given to the eve or vigil of All Hallows, or festival of All Saints, which being the 1st of November, Halloween is the evening of the 31st of October. In England and Scotland it was long consecrated to harmless fireside revelries, with many ceremonies for divining a future sweetheart. See Burns's 'Halloween' and Chambers's *Book of Days*. The similar Irish customs are illustrated in Maclise's 'Drop-apple Night.'

Hallstatt, an Austrian village near Gmunden, once a great Celtic capital. See IRON AGE.

Hallucinations. To realise in any proper way what memory is from the physiological point of view, we must assume that every impression on the senses is conducted by molecular movements through the nerves to the ultimate cells of the brain, which then undergo a certain molecular change that is revealed to consciousness as the qualities of the thing seen or heard or felt. By a process of instinctive reasoning the thing itself is thus instantly realised in the grown man, but not in the child. This molecular change in the cells may be evanescent, or it may be lasting. When lasting, the impression may be said to be 'registered,' so that it can come before consciousness again, and be 'remembered.' Each act of memory of the same impression in a healthy brain adds to the distinctness of the registration, and it is thus more and more easily recalled or suggested, either spontaneously or from without. The millions of brain-cells contain an inconceivable number of such registered impressions of things seen, heard, touched, smelt, and tasted, besides the impressions of past states of feeling, past trains of thought, and recombinations of them by means of the imagination. It is in no way thought a strange thing that we can recall all these in memory at any time, or that by unconscious processes of association they project themselves across the field of consciousness irrespective of our wills. It is not thought so very strange that, when we take a dose of opium or cocaine, the registered images lying in the brain-cells rise up and come across our consciousness so vividly that we cannot distinguish between them and real objects seen with the eyes. The same phenomenon often occurs in conditions of half sleep. In dreaming the impressions appear perfectly real to the half-consciousness existing at the time.

Now there are certain very sensitive people, who have an element of the morbid in their brain condition or heredity similar to the morbidness caused by a dose of cocaine. This being so, what is the difficulty in believing that those registered brain images should stand out, and seem to the consciousness as real as the original impression, and so produce a *hallucination*, or a subjective impression from an image already in the brain that is practically the same to the consciousness as the impression from a real object? This is in no way more remarkable than memory itself. It is simply more unusual. It is very questionable whether the original acts of memory of the young child are not all of the nature of hallucinations. The after recollections of things seen and of things imagined are certainly so real to some children that they confuse them with things seen or experienced. If a man can by using tests, and by the use of his reason, be made to know that the thing that appears to be seen and real is not so, and has no objective existence where he sees it, and that it is his brain that is playing him a trick, he has a sane hallucination. If he cannot be made to do so, and thinks it a real object, he is insane to this extent. The condition of hypnotism illustrates the origin of hallucinations better than almost anything else. Hypnotism (q.v.) is a modified, artificially-induced sleep, in which the consciousness is changed but not abolished, and the reasoning power much impaired. If a person hypnotised is told that a piece of ice is red-hot, he will not touch it, and if he is made to do so, he behaves as if he had touched hot iron. His whole mental condition is one of temporary hallucinations of every sort. Yet in the face of all these scientific facts and reasonable hypotheses and deductions we have persons calling in the aid of imaginary forces, 'telepathy,' 'spirits,' 'psychic force,' &c., to explain hallucinations, and associations formed for 'psychical research,' evidently on the theory that there can be a cause for hallucinations other than the registered images in the brain itself, together with altered conditions of consciousness. Many religious leaders and others in a state of intense brain excitement from religious or other causes have had hallucinations, after they had been sinning against nature's laws by depriving themselves of sleep and of exercise, and by exposing themselves to the contagion of morbid feeling interspersed by reason or common sense. Luther's seeing the devil, and throwing his ink-bottle at him, and Swedenborg's seeing spiritual beings among the ministers at the council board are certainly explicable on the theory of suggestion and a temporary morbidness of brain-working.

But, say the telepathists, 'two people have had the same hallucination at the same moment. How can that be explained on brain-cell principles?' If two people had been thinking of the same thing—for example, a dear friend or relative of both who was ill and supposed to be dying—and if both were sensitive persons, and their feelings were very excited at the time, what marvel is it if

through a rare coincidence they had seen the form of the dying friend? And if this impression happened to be near the time when he died, is it remarkable in the unscientific state of most minds that they made out it was the same moment that they both saw their friend's form appear and walk out at the door? When such duplicate hallucinations are probed by hard scientific methods it is always found that the hour of seeing them by the two people was not quite the same, that one had previously made a suggestion to the other forgotten in the excitement of the moment, or that the figures seen by them had on different clothing, or had quite different beards. Without far more evidence than has been brought forward by the pseudo-scientific believers in ghosts and apparitions, an age of science will never admit a hallucination to be anything but a brain phenomenon, obscure perhaps, but no more obscure than many other correlated facts of brain and mind. Every advance that is made in our knowledge of the brain and its working in relation to mind renders the rational and scientific explanation of all the hallucinations of the sane recorded by trustworthy, unbiassed observers more easy and probable, and makes less excusable the calling in to explain the facts of new and unknown 'forces' or 'influences' in nature beyond those we know and can scientifically investigate. Hallucinations may be of all the senses, and may be of every degree of variety and complication, from flashes of light to armies of men, from hummings in the ear to strains of 'celestial music.' But it has never been proved, as ought certainly to have occurred if there was any reality in those occult forces, that anything has ever been seen or heard by any one which the person might not possibly have seen or imagined previously, so that its image might be lying registered in his brain-cells; and no new knowledge has ever come to humanity from such sources. Hallucinations were much more common among primitive peoples and in the early ages of the world than they are now. See INSANITY.

Halluin, a town in the French department of Nord, 10 miles NNE. of Lille. Weaving of linen and woollen goods, bleaching, brick-making, and the manufacture of oil, chemicals, and chocolate are the principal industries. Pop. 9809.

Halmstad, a seaport of Sweden, and capital of the province of Halland, on the Cattegat, 75 miles SE. of Gothenburg, with trade in corn, wood, flour, and coal, and salmon-fisheries. Pop. 11,825.

Halogens, or SALT-PRODUCERS (Gr. *hals*, 'salt'), are a well-characterised group of non-metallic elements—chlorine, bromine, iodine, and fluorine—which form with metals compounds analogous to sea-salt. For haloid salts, see SALT.

Haloragæ, an order of thalamiflora dicotyledons, vegetatively reduced from Onagraceæ (q.v.). There are about seventy known species, herbaceous or half-shrubby; universally distributed, and almost all aquatic, or growing in wet places. The stems and leaves often have large air-cavities. The plants are insignificant in appearance, and the flowers generally much reduced. None of them have any important uses, except those of the genus Trapa (q.v.). The only British species are the Mare's Tail (*Hippuris vulgaris*) and the Water-milfoils (Myriophyllum).

Halos and **Coronæ.** Halos are circles of light surrounding the sun or moon, and are due to the presence of ice-crystals in the air. The commonest and usually the brightest has a radius of about 22 degrees—i.e. this is the angular distance from the sun to its inner edge. This size can be computed from the hexagonal shape and known refractive power of ice-crystals. The calculation shows that light passing through the sides of such a crystal is bent at an angle varying with the direction in which it falls on the crystal, but never less than 21½ degrees, which is therefore called the angle of minimum deviation, and in the greater number of cases not greatly exceeding that angle. If, therefore, the air between the observer and the sun or moon be filled with such crystals the light will be thrown outwards beyond the angle of minimum deviation, and will mostly appear at about 22 degrees distance from the sun or moon, forming a circle round it. As blue light is slightly more refrangible than red it is thrown farther out, and the halo appears coloured red inside and blue outside. Some of the crystals may, however, be lying so that the light enters at a side and leaves at one end, or *vice versâ*, in which case the angle of minimum deviation is about 46 degrees, at which distance a second fainter halo is frequently seen with colours in the same order as in the first. These colours are generally well seen in solar halos, but not in lunar, as the moon's light is too faint to give distinct colour to each part. In addition to the above, a third still larger halo has been seen. There are only four observations of this halo on record, and the radius has been estimated in the different cases at from 81 degrees to 90 degrees. The cause of this halo has not been ascertained. It is not coloured, and may be due either to some more complex form of ice-crystal or to internal reflection from the hexagonal crystals.

Another phenomenon sometimes seen with halos is the *Parhelic circle*, which is a white circle passing through the sun and parallel with the horizon. It is caused by light reflected from the surfaces of ice-crystals falling vertically through the air. When the sun is near the horizon this circle is intensified at distances of 22 degrees and 46 degrees from the sun, and forms parhelia or mock-suns, and another mock-sun is sometimes seen on this circle directly opposite the sun. A similar circle is also formed passing vertically through the sun by reflection from the upper and under surfaces of the ice-crystals. Halos are sometimes accompanied by contact arches, which are arcs of circles touching the halos of 22 degrees and 46 degrees; they are formed by long hexagonal prisms floating horizontally in the air, and are curved away from the sun when it is below 30 degrees altitude, but are concave towards it at greater elevations. Several other more complex forms of halo have been seen in the arctic regions, but are of rare occurrence in Britain.

Halos must not be confused with *Coronæ*, which are smaller coloured circles that appear round the sun or moon when they shine through thin cloud or mist. In these the red is the outermost colour, and several successive sets of coloured rings are usually formed. They are due to the diffraction the light undergoes in passing among the drops of which the cloud is composed. The radius of the first red ring of a corona varies from 1 degree to 3 degrees, according to the size of the drops, and the radii of the others are successive multiples of that of the first.

When the sun shines on a bank of fog a large bow of about 40 degrees radius, resembling a rainbow, but not so brightly coloured, is seen. It is often double, like the rainbow. Owing to the smaller size of the water-drops in a fog than in falling rain, the *Fogbow* is wider and fainter than the rainbow. The law determining the order of the colours—whether red inside or red outside—has not yet been thoroughly worked out. If the observer is standing on an elevated point so that his shadow falls on the fog, coloured rings called *Glories* or Anthelia are often seen. Five or six sets of colours have been observed, the outermost

having a radius not exceeding 12 degrees. In each ring the red is outside, showing that it is a diffraction effect like a corona, but the exact cause has not been determined. If the fog is very near, the observer's shadow is visible, forming what is known as the Brocken Spectre (see MIRAGE); and if the fog is thin the shadow looks farther away than it really is, and is therefore supposed by the spectator to be of gigantic size.

Halos, in religious art. See NIMBUS.

Hals, FRANS, the elder, portrait and *genre* painter, was born, probably at Antwerp, in 1580 or 1581, though some authorities give 1584 as the date. His parents, members of an old Haarlem family, returned to that city about 1600, and Hals studied under Karel van Mander and, according to some accounts, under Rubens. Some ten years later he married Anneke Hermanszoon, and in 1615 he was summoned before the magistrates and reprimanded for ill-treating his wife and for his drunken and disorderly life. A few weeks later his wife died, and in 1617 he married a woman of doubtful character, Lysbeth Reynier. In his later years, in spite of his unceasing industry, to which the numerous works from his hand in the continental galleries bear witness, he fell into poverty, and was relieved by the municipality of Haarlem, who in 1664 bestowed on him a pension of 200 florins. He died at Haarlem in 1666, and on the 1st of September was buried in the church of St Bavon. Hals is usually regarded as the founder of the Dutch school of *genre*-painting. His subjects of feasting and carousal are treated with marvellous vivacity and spirit, and as a portrayer of faces convulsed with laughter he is without a rival. His portraits are full of character, and catch with admirable subtlety the lightest shades of passing expression. Technically his work is masterly, his handling being most direct and powerful; but a certain hardness and crudeness of tone is frequently apparent in his rendering of flesh, and his later works have little variety of colouring, and show an unpleasant blackness in the shadows. Of his portrait groups eight noble examples are preserved in the museum of Haarlem, the finest being that dated 1633, representing the officers of the corps of St Adrian. The 'Mandoline Player' (1630), in the gallery of Amsterdam, is a typical example of his treatment of single figures. A series of excellent etchings after the works of Hals, by Professor William Unger, with text by C. Vosmaer, was published in Leyden in 1873. As a teacher he exercised a marked influence upon the development of Dutch art, Jan Verspronck, Van der Helst, Adrian van Ostade, Adrian Brouwer, and Wouwerman having been his pupils. An interesting view of the interior of his studio, dated 1652, by Job Berch-Heyde, another of his scholars, is in the Haarlem Museum.—His brother, DIRK HALS, a pupil of Abraham Bloemaert, was also an excellent *genre*-painter (*b.* before 1600, *d.* 1656); and several of Frans's sons were artists, the most celebrated being Frans Hals, the younger, who flourished from about 1637 to 1669.

Halstead, a market-town of Essex, on the Colne, 56 miles NE. of London. The parish church has a wooden spire and many old monuments; the free grammar-school dates from 1590. It has manufactures of crape, silk, and paper; straw-plaiting is also carried on. Pop. 6959.

Halyburton, THOMAS, a Scotch divine, was born at Dupplin near Perth in 1674, and was for eleven years minister of Ceres in Fife, and then for two professor of Divinity at St Andrews, where he died in September 1712. He was the author of several works, including *Natural Religion insufficient, and Revealed necessary, to Man's Happiness; The Great Concern of Salvation*; and *Ten Sermons preached before and after the Celebration of the Lord's Supper*. The works, especially the autobiographic memoir, of the 'Holy Halyburton' were once very popular among the people of Scotland; and even at the present day they are still read. They were published, together with an Essay on his Life and Writings, by Dr Robert Burns (London, 1835).

Halys. See ASIA MINOR.

Ham, properly the hind part or angle of the knee; but usually applied to the cured thigh of the hog or sheep, more especially the first. Ham-curing, or, what is the same thing, bacon-curing, is performed in a variety of methods, each country or district having its own peculiar treatment; these, however, relate to minor points. The essential operations are as follows: The meat is first well rubbed with salt, and either left on a bench that the brine may drain away, or covered up in a close vessel; after a few days it is rubbed again, this time with a mixture of salt and saltpetre, to which sugar is sometimes added, or with a mixture of salt and sugar alone. It is then consigned to the bench or tub for at least a week longer, after which it is generally ready for drying. *Wet salting* requires, on the whole, about three weeks; *dry salting*, a week longer. Mutton-hams should not be kept in pickle longer than about three weeks. Some hams are merely hung up to dry without being smoked; others, after being dried, are removed to the smoking-house, which consists of two and sometimes three stories; the fire is kindled in the lowest, and the meat is hung up in the second and third stories, to which the smoke ascends. The fire is kept up with supplies of oak or beech chips, though in some districts twigs of juniper, and in many parts of Great Britain peat, are used. Fir, larch, and such kinds of wood, on account of the unpleasant flavour they impart, are on no account to be used. The fire must be kept, night and day, in a smouldering state for three or four days, at the end of which time the ham, if not more than five or six inches deep, is perfectly smoked. As cold weather is preferable for the operation of curing, it is chiefly carried on during winter. Many of the country-people in those parts of England where wood and peat are used for fuel smoke hams by hanging them up inside large wide chimneys, a method common in Westmorland. The curing of beef and mutton hams is carried on chiefly in the north of England and Dumfriesshire in Scotland; that of pork-hams, on the other hand, is found in various countries, among the best known being those connected in commerce with the names of Belfast and Westphalia. Harris of Calne, Wiltshire, introduced an ammonia freezing-process available both summer and winter. Chicago (q.v.) is the chief centre of the enormous American industry of pork-packing. The imports of bacon and hams into the United Kingdom in 1888 amounted to 3,594,212 cwt., of a value of £8,343,387. Of this quantity the value from the United States was £3,874,170, from Denmark £1,389,047. The import of hams only in 1888 was 730,408 cwt., of the value of £1,929,602. The total value of the imports of bacon and hams in 1886 was £8,402,828; in 1894, £10,855,715. The total export of bacon and hams from the United States is valued at upwards of $30,000,000 a year. See PIG.

Ham, a town in the French department of Somme, on the river of that name, 12 miles SW. of St Quentin. Its ancient fortress or castle was rebuilt by the Comte de Saint Pol in 1470, and now is used as a state prison. It is memorable as the place of confinement of Joan of Arc, Moncey, and others; of Polignac, Peyronnet, and

Guernon de Ranville from 1831 to 1836; of Louis Napoleon from 1840 till 1846; and after the *coup d'état*, of the republican generals Cavaignac, Lamoricière, Changarnier, &c. Pop. 2837. See Gonnard, *Ham, son Château*, &c. (1864).

Ham, West, a suburb of East London, and a parliamentary and county borough of Essex, on the north bank of the Thames, opposite Greenwich. In fifty years its population grew from 10,000 to 204,903 (1891), principally owing to the Victoria and Albert docks and the gas works. It is a busy industrial parish, and has silk-printing, shipbuilding, distilling, and chemical manufactures. In 1885 it was made a parliamentary borough, returning two members to the House of Commons. Here is Mrs Elizabeth Fry's house, 'The Cedars.' East Ham, situated in the south-west of the same county, 1½ miles SW. of Barking, has a population of 9713. See Katharine Fry, *History of the Parishes of East and West Ham* (1888).

Ham, according to the writer of Genesis, was the second son of Noah, and the brother of Shem and Japheth. The name, however, as generally used, is geographical rather than ethnographical. The word Ham in Hebrew signifies 'to be hot,' and the descendants of this son of Noah are represented as peopling the southern regions of the earth, so far as known at that time—viz. Arabia, the Persian Gulf, Egypt, Ethiopia, Libya, &c. Ham has also been identified with Kemi ('black land'), an ancient name of Egypt; but for this identification there exists no satisfactory philological evidence. Philologists and ethnologists recognise as a distinct family of peoples and tongues a group which they call 'Hamitic,' classifying it as co-ordinate with the Aryan and the Semitic. See Africa, Vol. I. pp. 85, 86.

Hamadan, a town of Persia, in the province of Irak Ajemi, is situated at the northern base of Mount Elwend, 160 miles WSW. of Teheran. It contains some notable tombs—e.g. Avicenna's (q.v.) and others affirmed to be those of Mordecai and Esther. Being the centre of converging routes from Bagdad, Erivan, Teheran, and Ispahan, it is the seat of a large transit trade; and it carries on extensive manufactures of leather, and in a less degree of coarse carpets and woollen and cotton fabrics. Pop. 30,000. Hamadan is generally believed to occupy the site of the Median Ecbatana (q.v.).

Hamadryads. See Nymphs.—The name *Hamadryas* is given to a kind of Baboon (q.v.); and the *Hamadryas* or *Ophiophagus elaps* is the largest poisonous snake of the Old World, larger and more dangerous than any of the cobras, with which it has almost the same geographical range.

Hamah (Gr. *Epiphania*), the Hamath of the Bible, a very ancient city of Syria, on the Orontes, 110 miles N. by E. of Damascus. The town stands in the midst of gardens, though the streets are narrow and irregular, and the houses are built of sun-dried bricks and wood. The inhabitants, about 45,000, manufacture coarse woollen mantles and yarn, and carry on considerable trade with the Bedouins. Hamath seems to have come very early in conflict with the Assyrians, having been taken by them in 854 B.C. and again in 743, whilst two revolts of the people were crushed by the Assyrians in 740 and 720 B.C. After the Græco-Macedonian conquest of Syria, Hamah became known as Epiphania. In 639 it fell into Moslem hands, and, though it was held by Tancred from 1108 to 1115, it was again taken possession of by the Moslems. Abulfeda, the Arab geographer, was prince of Hamah in the 14th century. Four stones were discovered there in 1812 by Burckhardt, bearing inscriptions in an unknown language, now believed to be Hittite (q.v.).

Hamamelideæ. See Witch Hazel.

Hamann, Johann Georg, a German writer, born at Königsberg in Prussia, 27th August 1730. The incompleteness and aimlessness which characterised his education clung to him all his days: he made numerous starts in life, but followed no one calling for long; in turn, student of philosophy, of theology, of law, private tutor, merchant, tutor again, commercial traveller, student of literature and the ancient languages, and clerk, he at length settled down in Königsberg in 1767 as an official in the excise. Nevertheless he lived but meanly until the present by a patron, in 1784, of a sum of money raised him above want. He died at Münster, 21st June 1788. His writings are, like his life, desultory and without system; but even as such they exercised a perceptible influence upon Jacobi, Herder, Goethe, and Jean Paul. For in spite of their symbolical and oracular style, qualities which led to their author being designated the 'Magus of the North,' they contain the results of thoughtful and extensive reading, are rich in suggestive thought, encrusted with paradox and sarcasm, and thoroughly bristle with literary allusions. Hamann's independence and love of honest truth made him, however, unpopular with his contemporaries, except the more thoughtful few. Compare Roth's edition of his *Sämmtliche Schriften* (8 vols. 1821–45) or Gildemeister's (6 vols., including biography, 1857–73). See Lives by Poel (1874–76) and Claasen (1885).

Hambato, or Ambato, capital of Tunguragua province, Ecuador, in a sheltered amphitheatre on the northern slope of Chimborazo, 8860 feet above the sea. It was twice destroyed—by an eruption of Cotopaxi in 1698, and by an earthquake in 1796, but was speedily rebuilt. Pop. 12,000.

Hamburg, a constituent state of the German empire, includes the free city of Hamburg, the towns Bergedorf and Cuxhaven, and several suburbs and communes, with a total area of 158 sq. m. The free Hanseatic city of Hamburg is situated on the Elbe, about 75 miles from the German Ocean, 112 N. of Hanover, and 177 NW. of Berlin. Hamburg was founded by Charlemagne in 808, and for three centuries had to struggle hard to maintain itself against the marauding Danes and Slavs. It was made a bishopric in 831, and three years later an archbishopric. This last dignity was transferred to Bremen in 1223. The commercial history of Hamburg began in 1189–90, when the emperor granted it various privileges, amongst others a separate judicial system and exemption from customs dues. In 1241 it joined with Lübeck in laying the foundation of the Hanseatic League (q.v.), and from 1259 associated itself closely with Bremen also. From that time it increased rapidly in wealth and commercial importance, augmenting its territory by the purchase of the township of Ritzebüttel, at the mouth of the Elbe (where the harbour of Cuxhaven is now situated), and of several villages and islands in the vicinity of the town. Under the protection of the German emperors Hamburg soon became powerful enough to defend itself and its commerce both by sea and land, and carried on war for a considerable period against sea-rovers and the Danes. In 1510 it was made an imperial town by Maximilian I. It early embraced the doctrines of the Reformation. During the stormy period of the Thirty Years' War it never had an enemy within its walls. All through the years from 1410 to 1712 there were repeated risings of the populace against the governing classes. The disputes with Denmark finally ceased in 1768, that power renouncing all claim to Hamburg territory. The rapid commercial success and steadily increasing prosperity of the city were only momentarily checked by a severe

commercial crisis in 1763. On the other hand, the French Revolution drove many of the *émigrés* to Hamburg, and the ranks of its merchants were still further strengthened by refugees from Holland, when that country was overrun by the French in 1795. But eleven years later Hamburg itself was occupied by the French, and with that event there commenced for the city a period of great tribulation. In 1810 it was annexed to the French empire, but at the same time lost its commerce and its shipping trade. For having in 1813 admitted the Russians within its walls the city was cruelly treated by Davoût, Napoleon's general; and the cup of its misery was filled to the brim by the siege which Bennigsen began in that same year.

Between 1806 and 1814, when the French occupation came to an end by the capitulation of Davoût to the allies, the population decreased by nearly one-half, namely to 55,000, and had to endure losses of property estimated at £7,000,000. In the following year Hamburg joined the German Confederation as one of the four free cities, and its prosperity began rapidly to revive. Another calamity overtook the town in 1842: in three days one-third of Hamburg was destroyed by fire, and more than two millions sterling worth of property lost. That part of the town was, however, immediately rebuilt in modern style. The older portion is intersected by canals, which serve as waterways between the river and the warehouses. The ramparts have been converted into gardens and promenades. In 1843 an agitation was set on foot for a reform in the constitution, a step which it took eighteen years to carry into effect. On 1st October 1888 Hamburg entered the German Customs Union, though still retaining part of its territory as a 'free port.' This change has necessitated extensive alterations in the harbour: several quays have been built, warehouses constructed, steam-cranes erected, and the railway communication with the chief industrial centres of Germany improved. In 1890 new docks were in course of construction at Cuxhaven for the use of the great ocean-going steamers. The finest public buildings are the 'school house' (containing the town library of 400,000 volumes and 5500 MSS., and a natural history museum), town-house, picture-gallery, exchange, bank, post-office, and some churches. Of these last four are noticeable—St Nicholas, built from designs by Sir Gilbert Scott, as a memorial of the fire of 1842, a handsome Gothic building, with a spire 482 feet high; St Michael's, an 18th-century Renaissance church, with a spire 469 feet high; and St Catherine's and St James's, both Gothic edifices of the 14th and 15th centuries. In addition to numerous excellent schools and charitable institutions, Hamburg possesses a school of navigation, with which is connected an observatory, a zoological and a botanical garden, and several museums and art-galleries. Hamburg has played an important part in the history of the German stage.

Hamburg is the busiest commercial city on the continent of Europe, and the principal commercial seaport of Germany. Next to London it has the largest money-exchange transactions in Europe; the bank of Hamburg was founded so long ago as 1619. As a commercial centre its only rivals are London, Liverpool, Antwerp, and New York. Its manufactures, though a long way inferior in value to its commerce, are not unimportant. The principal are cigar-making, distilling of spirits, sugar-refining, brewing, engineering, iron-founding, manufacture of chemicals, india-rubber wares, furniture, starch, and jute, and shipbuilding. In 1865 the number of vessels that entered the port was 5186, with a gross burden of 1,223,000 tons; these figures rose to 5260 vessels and 2,118,000 tons in 1875, and to 6790 vessels and 3,704,000 tons in 1885, whilst in 1887 they were 7308 vessels and 3,990,000 tons. The number and tonnage of the vessels that cleared were about the same in the corresponding years. Of the vessels entering in 1887 about 36 per cent. were British. The imports have increased at an extraordinarily rapid rate: in 1864 they were valued at £57,976,000, in 1875 at £85,050,000, in 1885 at £102,300,000, and in 1887 at £111,948,800. These returns do not include bullion. The total value of the trade of Hamburg with Great Britain and her possessions amounted to £28,000,000 in 1887. Of the imports about one-half represent the value of goods brought into Hamburg by rail and river (Elbe) from the interior of the country. Next after Great Britain the countries with which Hamburg has commercial transactions of the greatest magnitude are the United States, the countries on the west and east coasts of South America, France, Holland and Belgium, Central America, Russia, the East Indies and China, and the east and west coasts of Africa. Hamburg owes a large part of its trade to its position as a distributing centre for commodities brought from distant parts of the world, to be afterwards sent to the different countries of Europe. In 1891 the total imports (without bullion) were valued at £138,270,000, and the exports at £121,795,000. Hamburg is a great port for emigration. The city was severely visited by cholera in autumn of 1892; there were 17,000 cases and 9000 deaths. In 1880 the population of the state was 518,468. In 1890 the population was, in the city, 323,923; suburbs, 245,337; rest of the territory, 53,270; total of the state, 622,530. There were 23,351 Catholics, and 17,877 Jews.

See Mönckeberg, *Geschichte der Freien und Hanse-Stadts Hamburg* (1885); Gaedechens, *Historische Topographie der Freien und Hanse-Stadt Hamburg* (1880); and two historical works by Gallois (1856–57 and 1861–65).

Hameln, a town and formerly a fortress of Hanover, occupies a commanding position on the Weser, 25 miles SW. of Hanover. It presents a quite medieval appearance, having many houses and buildings surviving from the Gothic and Renaissance periods of architecture. The chain-bridge which here crosses the Weser was completed in 1839, and is about 840 feet in length. The chief employments of the people are machine-making, iron-founding, wool-spinning, fish-breeding, brewing, and the manufacture of leather, paper, artificial manure, and chemicals. In the earliest times Hameln belonged to the Abbey of Fulda, and was a member of the Hanseatic Confederation. It suffered severely during the Thirty Years' War. Pop. (1885) 11,831. With this town is connected the well-known legend of the Piper (or Ratcatcher) of Hameln, who in 1284 freed the town from rats through the mystic charm of his pipe; but, when the people refused to pay him the promised reward, he exercised the power of his music upon the children of the place, and drew them away into the heart of an adjoining hill, which opened to receive them, and through which he led them to Transylvania. The story is familiar from Browning's 'Pied Piper of Hamelin.'

Hamerling, Robert, Austrian poet, was born of poor parents at Kirchberg in the Forest, in Lower Austria, on 24th March 1830. Having completed his studies at Vienna, Hamerling became a teacher in the gymnasium at Trieste in 1855. But at the end of eleven years of work, ill-health compelled him to retire. From that time down to the date of his death, on 13th July 1889, he lived at Gratz, almost entirely confined to his bed, but nevertheless leading a busy life as a writer of poetry. He began his career by the publication in 1860 of a volume of lyrics, *Sinnen und Minnen* (7th ed.

1886; each edition enlarged and improved). His lyric talent found expression also in such later works as *Das Schwanenlied der Romantik* (1862), *Amor und Psyche* (1882), and *Blätter im Winde* (1887). But his best books are three satirical epics—*Ahasver in Rom* (1866; 17th ed. 1889), *Der Kampf ums Dasein* (1869), and *Homunculus* (1888). In these books his theme is the problems that are knit about the inner nature of man, his mundane existence, and the institutions his mind has conceived and his hand has made. The structural conceptions are often grand, and the imagination bold; the emotional and descriptive colouring is both rich and truthful, the action vigorous, the philosophy ultra-modern; and there is a firm grasp of details, and a patient and clever use of them, mostly for satiric purposes. Satire is indeed one of the strongest elements in these epics. Hamerling's remaining works include *Venus im Exil* (1858); *Germanenzug* (1864), a translation of Leopardi's poems (1865); a novel, *Aspasia* (1875); a tragedy, *Danton und Robespierre* (1871); two or three other dramatic pieces; *Die sieben Todsünden* (1873); an autobiographical work, *Stationen meiner Lebenspilgerschaft* (1886); *Lehrjahre der Liebe* (Letters, &c. 1889). *Sämmtliche Werke* (Hamburg, 1889). See Life by A. Polzer (1889).

Hamerton, Philip Gilbert, was born, the son of a solicitor, at Laneside near Oldham, on 10th September 1834. According to the autobiography contained in the Life published by his widow in 1896, his youth was quite exceptionally unhappy. He commenced writing on art for magazines and reviews, and soon produced a volume of poems on *The Isles of Loch Awe* (1855), and *A Painter's Camp in the Highlands, and Thoughts about Art* (1862). In 1868 he published *Etching and Etchers* and *Contemporary French Painters;* a continuation of the latter appeared in the following year, *Painting in France after the Decline of Classicism.* From 1869 he edited the *Portfolio*. *The Intellectual Life* (1873) is in the form of letters of advice, illustrated by many examples, addressed to literary aspirants and others, of every class and in all circumstances; *Human Intercourse* (1884) is a volume of essays on social subjects, many of them dealing with intercourse as affected by nationality; *The Graphic Arts* (1882), finely illustrated, is 'a treatise on the varieties of drawing, painting, and engraving, in comparison with each other and with nature,' the analyses of the technique of the masters of the various arts being remarkable for discrimination and acumen; *Landscape* (1885), a superbly-illustrated volume, is not so much a treatise on landscape-painting as a work illustrating the influence of natural landscape on man. Other works are *Portfolio Papers* (1889), *French and English* (1889), *Man in Art* (1893), a couple of novels, and his *Life of Turner* (1879); and to this Encyclopædia he contributed the articles Painting, Rembrandt, and Turner. He lived many years in France, and died at Boulogne-sur-Seine, 6th November 1894.

Hamesucken, in Scots law, the offence of assaulting a man in his own house.

Hamilcar, next to Hannibal the greatest of the Carthaginians and one of the greatest generals of antiquity. He was surnamed Barca (the Hebrew *Barak*) or 'Lightning.' When a young man he came into prominence in the sixteenth year of the First Punic War (247 B.C.), when all Sicily, save the fortresses of Drepanum and Lilybæum, had been wrested from Carthage by the Romans. After ravaging the Italian coast, he landed in Sicily, near Panormus, and seized the stronghold of Ercte, a hill of 2000 feet high rising sheer from the sea. Here, with a small band of mercenaries, though he received no aid from his unworthy countrymen, he waged almost daily war with the Romans for three years, and defied every effort to dislodge him. By the spell of his genius he preserved discipline among his unpaid followers, whom he taught to banish their old dread of the Roman veterans, while with his few ships he harassed the Italian shores. In 244 B.C. he occupied Mount Eryx, a hill 2 miles from the coast and a less strong position than Ercte, but one which lay nearer to the besieged cities of Drepanum and Lilybæum. For two years he stood at bay with his handful of men against a Roman army, 'fighting,' says Polybius, 'like a royal eagle, which, grappling with another eagle as noble as himself, stops only to take breath from sheer exhaustion, or to gather fresh strength for the next attack.' The battle of the Ægatian Isles in 241 B.C. ended the First Punic War, and Sicily was yielded to Rome. But Hamilcar marched out from Eryx with all the honours of war. Scarcely had peace been concluded when the Carthaginian mercenaries revolted and were joined by the subject Libyans. Hanno, a personal enemy of Hamilcar, was sent against them. He failed, and the task of saving the state was assigned to Hamilcar, who crushed out the rebellion after a terrible struggle of three years in 238 B.C. In the same year the Romans, in defiance of treaty engagements, seized on the Carthaginian possessions in Corsica. Despite the antagonism of the peace party, headed by the incompetent Hanno, the patriotic or Barcine party, though a minority, obtained the command of an army for Hamilcar, with which he resolved to carry out his master-conception. He proposed to throw Spain into the balance to redress the loss of Sicily. Spain was not only rich in mineral and other wealth; she would form an admirable recruiting-ground. The main defect in the Carthaginian armies hitherto had been the want of an infantry capable of coping on at all equal terms with the legionaries. Such a force Hamilcar determined to create in Spain, whence it could be marched or carried over sea to Italy; in future the war would be waged on Roman soil. In 237 B.C. the general entered Spain, and in nine years built up a new dominion by his military genius, his policy, and the magic of his personality. In 228 B.C. he fell fighting against the tribe of the Vettones. The conceptions of the great Hamilcar were carried out by his mightier son. Unfortunately only a dim light is cast on Hamilcar's marvellous career. What is incontestable is that he was a military genius of the highest order; a statesman as lofty in his conceptions as he was adroit in carrying them out; a patriot whom neither obloquy, ingratitude, nor treachery could alienate from the ignoble state he strove so hard to save. Two men only, it has been truly said, in the whole course of Roman history, seem to have struck the Romans with real terror. These were Hamilcar and his greater son. See Bosworth Smith's *Carthage and the Carthaginians* (1879).

Hamilton, a town of Lanarkshire, on the left bank of the Clyde, 10 miles SE. of Glasgow. The principal edifice is the burgh buildings (1863), with a clock-tower nearly 130 feet high; and there are also the county buildings, large barracks, and a good racecourse. The former manufactures of lace, tamboured bobinette, and cambric have declined; and mining is now the chief industry of the district. Hamilton was made a royal burgh in 1548, and one of the five Falkirk parliamentary burghs in 1832. Pop. (1841) 8724; (1881) 18,517; (1891) 24,863. In 1886 the parliamentary boundary was made coincident with the municipal (extended in 1878).—Hamilton Palace, successor to Cadzow Castle, is the seat of the Duke of Hamilton. Dating partly from 1594, but greatly enlarged in 1705 and 1822, it is a sumptuous classical structure, though its choicest art-collections were

sold in 1882 for nearly £400,000. Within its policies are a superb mausoleum (1852), the ruins of Cadzow Castle, the herd of wild white cattle, and some primeval oaks.

Hamilton, a city of Canada, the chief town in the county of Wentworth, Ontario, is situated on Burlington Bay, at the west end of Lake Ontario, 40 miles by rail SW. of Toronto, and 56 WNW. of Niagara Falls. The business portion lies at the foot of 'The Mountain,' on whose slope many fine residences are embowered among trees and gardens. Trees line the wide, handsome streets; the houses are mostly substantial stone erections, and the court-house and county buildings are among the finest in Canada. The city is an important railway centre, stands in the midst of a populous and highly-cultivated district, at the head of the lake navigation, and is said to possess a larger number of manufactories of iron, cotton, and woollen goods, sewing-machines, boots, glass-ware, &c. than any other town in Canada. Hamilton, which was founded in 1813, is the seat of an Anglican and of a Roman Catholic bishop, and sends two members to the House of Commons and one to the provincial legislature. Pop. (1861) 19,096; (1881) 35,961; (1891) 48,980.

Hamilton, metropolis of the western part of Victoria, on Grange Burn Creek, 224 miles by rail W. of Melbourne. Two pastoral and agricultural exhibitions are held here annually, and two race-meetings. Pop. 3000.

Hamilton, (1) capital of Butler county, Ohio, on the Great Miami River, and on the Miami and Erie Canal, 25 miles by rail N. of Cincinnati. It has a number of paper and flour mills, several foundries, manufactories of farming-implements, breweries, &c. Pop. (1890) 17,565. (2) A post-village of New York, 37 miles SE. of Syracuse, is the seat of Madison University, and of Hamilton Theological Seminary, both Baptist. Pop. 1638.

Hamilton, capital (pop. 2100) of Bermuda (q.v.).

Hamilton, a great historical family, is believed to be of English origin. The pedigree of the family, however, cannot be carried beyond Walter Fitz-Gilbert (son of Gilbert), called Hamilton, who in 1296 held lands in Lanarkshire, and swore fealty to King Edward I. of England as overlord of Scotland, and in 1314 kept the castle of Bothwell, on the Clyde, for the English. His surrender of this strong fortress, and of the English knights and nobles who had fled to it from the field of Bannockburn, was rewarded by King Robert Bruce by grants of the lands and baronies of Cadzow and Machanshire in Clydesdale, Kinneil and Larbert in West Lothian, and other lands forfeited by the Cumyns and other adherents of England. He attained the rank of knighthood, and married Mary, daughter of Sir Adam of Gordon of Huntly. He left two sons. The elder, Sir David Fitz-Walter, was taken prisoner by the English at the battle of Neville's Cross in 1346, founded a chantry in the cathedral of Glasgow in 1361, and appears among the barons in the Scottish parliaments of 1368, 1371, and 1373. His eldest son, Sir David of Hamilton of Cadzow, was the first to assume the surname of Hamilton.

Dukes of Hamilton, &c. The family was only knightly till it was ennobled in its sixth generation, in Sir James of Hamilton of Cadzow, who in 1445 was created Lord Hamilton by a charter which consolidated his whole lands into the lordship of Hamilton, with his manor-place of 'the Orchard,' in the barony of Cadzow, as his chief messuage. In 1460 he founded a college in the university of Glasgow—the first college in Scotland founded by a layman. He also founded and endowed the collegiate church of Hamilton. Allied both by marriage and by descent to the Douglases, he followed their banner in the beginning of their great struggle with the crown. But he forsook them at a critical moment in 1454, and his seasonable loyalty was rewarded by large grants of their forfeited lands. At a later period, after the death of his first wife, when he must have been well advanced in years, he received in marriage the Princess Mary, the eldest daughter of King James II., formerly the wife of Thomas Boyd, the attainted Earl of Arran. His only son by her, James, second Lord Hamilton, was in 1503 made Earl of Arran, and had a grant of that island, the dowry of his mother on her first marriage. After playing an important part in public affairs during the minority of King James V., he died in 1529, being succeeded by the eldest son of his third wife (a niece of Cardinal Beaton), James, second Earl of Arran. The death of King James V. in 1542 left only an infant a few days old between him and the throne. He was at once chosen regent of the kingdom and tutor to the young queen, and declared to be 'second person in the realm.' He held his high offices till 1554, when he resigned them in favour of the queen-mother, Mary of Guise. He received in 1548, from King Henry II. of France, a grant of the duchy of Chatelherault. His eldest son, the Earl of Arran, was proposed at one time as the husband of Queen Mary of Scotland, and at another time as the husband of Queen Elizabeth of England. He was afflicted with madness in 1562, and never recovered his reason, although he lived till 1609. His father, the first Duke of Chatelherault, dying in 1575, the second son, Lord John Hamilton, commendator of Arbroath, became virtual head of the house, and as such was in 1599 created Marquis of Hamilton. He died in 1604, being succeeded by his son James, the second marquis, who in 1619 was created Earl of Cambridge in England, and died in 1625. His eldest son, James, the third marquis, led an army of 6000 men to the support of King Gustavus Adolphus of Sweden in 1631–32, and later acted a conspicuous part in the great contest between King Charles I. and the Scottish Covenanters. That king in 1643 created him Duke of Hamilton, with remainder to the heirs-female of his body, in the event of the death of himself and his brother without male issue. In 1648 he led a Scottish army into England for the king's relief, but was encountered and defeated by Cromwell at Preston, in Lancashire, and, ultimately forced to surrender to the parliamentary forces, was beheaded at Westminster in March 1649. He was succeeded by his brother William who in 1639 had been created Earl of Lanark, and died in 1651 of the wounds which he had received at the battle of Worcester. The duchy of Hamilton now devolved on the eldest daughter of the first duke, Lady Anne, whose husband, Lord William Douglas, Earl of Selkirk, was in 1660 created Duke of Hamilton for life. He died in 1694, and in 1698 the Duchess Anne, who survived till 1716, resigned her titles in the king's hands in favour of her eldest son, James, Earl of Arran, who was anew created Duke of Hamilton, with the precedency of 1643. In 1711 he was created Duke of Brandon in England, but the House of Lords refused him a seat or vote in parliament, on the ground that the crown was disabled by the Act of Union from granting a peerage of Great Britain to any person who was a peer of Scotland before the Union. The duke was killed in a duel in Hyde Park with Lord Mohun in 1712. His grandson, James, the sixth duke, who married the famous beauty, Elizabeth Gunning, was succeeded in 1758 by his eldest son, James George, an infant of three years old. On the death of the Duke of Douglas

in 1761, the male representation of the "red" or Angus branch of the Douglases, with the titles of Marquis of Douglas, Earl of Angus, &c., devolved on the Dukes of Hamilton, as descendants of the Duchess Anne's husband, William, Earl of Selkirk, natural son of the first Marquis of Douglas. Dying in 1769, in his fifteenth year, James George, seventh Duke of Hamilton, was succeeded by his only brother, Douglas, who in 1782 took his seat in parliament as Duke of Brandon, the House of Lords having resolved that the Act of Union did not prevent the crown from making a peer of Scotland a peer of Great Britain. He was succeeded by his uncle, ancestor of the twelfth duke (1845–95). The thirteenth duke, born 1862, is descendant of a third son of the fourth duke.

Dukes of Abercorn, &c. Lord Claud Hamilton, fourth son of the first Duke of Chatelherault, was appointed commendator of the abbey of Paisley in 1553, and created Lord Paisley in 1587. His descendants obtained successively the titles of Lord Abercorn (1603), Earl of Abercorn (1606), Viscount Strabane (1701), Marquis of Abercorn (1790). On the death of the second Duke of Hamilton in 1651, the second Earl of Abercorn claimed the male representation of the House of Hamilton; and in 1861 the second Marquis and tenth Earl of Abercorn (created Duke of Abercorn in 1868) was served heir-male of the first Duke of Chatelherault, in the Sheriff Court of Chancery at Edinburgh, under protest by the Duke of Hamilton, Brandon, and Chatelherault. Dying in 1885, he was succeeded by his son James, the second duke, born in 1838. The Duke of Abercorn is one of three peers who hold peerages in Scotland, in Ireland, and in Great Britain. A cadet of the House of Abercorn, born in 1646, was Count Anthony Hamilton (q.v.).

Other Peerages. The third son of Anne, Duchess of Hamilton, was in 1688 created Earl of Selkirk: this title became extinct in 1885 on the death of the sixth earl.—Lord George Hamilton, fifth son of Duchess Anne, was in 1696 created Earl of Orkney. The sixth earl succeeded in 1877.—A fourth son of Duchess Anne was in 1697 created Earl of Ruglen—a title that became extinct in 1810.—The Earls of Haddington are descended from a younger son of the first ascertained ancestor of the Hamiltons, Sir Walter Fitz-Gilbert.—Sir John Hamilton of Biel was created Lord Belhaven and Stenton. The second lord distinguished himself by his wild but eloquent speeches against the Union. On the death of the fifth lord in 1777 the title and estates became separated; the title became dormant in 1868, but was adjudged in 1875 to the ninth lord.—A descendant of the first Lord Paisley became Viscount Boyne in 1717, and his descendant became in 1866 Baron Brancepeth in the peerage of the United Kingdom.—Another branch of the Hamiltons, settling in Ireland, attained to the dignities of Viscount Claneboy (1622) and Earl of Clanbrassil. The titles became extinct in 1799, but the title of Lord Clanbrassil in the peerage of the United Kingdom was created in 1821.

A *Brefe Account of the Family of Hamilton*, written by Dr James Baillie of Carnbroe during the first half of the 17th century, is preserved among the MSS. in the Advocates' Library at Edinburgh. See Gilbert Burnet's *Memoirs of the Lives and Actions of James and Williams, Dukes of Hamilton and Chatelherault* (1677); Anderson's *Historical and Genealogical Memoirs of the House of Hamilton* (1825); "The Manuscripts of the Duke of Hamilton, K.T.," in part vi. of Appendix to the Eleventh Report of the Historical MSS. Commissioners (1887); and the history of the Earls of Haddington by Sir Wm. Fraser (2 vols. 4to, 1889).

Hamilton, Alexander, one of the greatest of American statesmen, was born 11th January 1757 in the West Indian island of Nevis, the son of a Scotch merchant who had married a young Frenchwoman. His father soon failed in business, and Alexander at the age of twelve had to enter the counting-house of a merchant named Cruger at St Croix. His extraordinary abilities, however, induced some of his friends to procure for him a better education than could be got at home. He was accordingly sent to a grammar-school at Elizabethtown, New Jersey; and in the spring of 1774 he entered King's (now Columbia) College, New York. On the first appearance of disagreement between Great Britain and her colonies, Hamilton, still a collegian and barely eighteen, wrote a series of papers in defence of the rights of the latter, which were at first taken for the production of the eminent statesman Jay, and which secured for the writer the notice and consideration of the popular leaders. On the outbreak of the war he obtained a commission as captain of artillery, saw some active service in New York and New Jersey, and gained the confidence of Washington, who made him his aide-de-camp in 1777, and with whom he acquired the greatest influence as his friend and adviser. In 1781, through hasty temper on both sides, the friendship was broken for a brief period, and Hamilton resigned his appointment on the staff; but he continued with the army and distinguished himself at Yorktown.

In 1780 he married a daughter of General Schuyler, who was a member of a powerful New York family. On the termination of the war he left the service with the rank of colonel, and, betaking himself to legal studies, soon became one of the most eminent lawyers in New York. In 1782 he was returned to congress by the state of New York. But there was as yet no national government nor any power higher than that of the several states, which were now nearly bankrupt; and in 1786 Hamilton took the leading part in the deliberations of the inter-state commercial convention at Annapolis, which prepared the way for the great convention that met at Philadelphia in the following year for the purpose of revising the articles of confederation. There, although his own plan for the formation of an aristocratic republic was set aside, the spirit of his system was to a large extent adopted. But Hamilton's best work for the constitution was done after the convention was dissolved. He conceived and started the famous series of essays which originally appeared in a New York journal, and which were afterwards collected under the title of *The Federalist*. Fifty-one out of the eighty-five essays were the work of Hamilton. They constitute the writings by which he is most widely known; they can scarcely be too highly praised for comprehensiveness, profundity, clearness, and simplicity, and their strength and value have been recognised in Europe as well as in America.

On the establishment of the new government in 1789 with Washington as president, Hamilton was appointed secretary of the treasury. The disorder of the public credit, and the deficiency of official accounts of the state treasury, rendered this office one of peculiar difficulty. In order to re-establish public credit, he carried, in the face of much opposition, a measure for the funding of the domestic debt, founded a national bank, rearranged the system of duties, and altogether showed himself to possess the genius of the great financier. Moreover, he practically organised the administration; and his reports, many of them on subjects outside the immediate scope of his own department, exhibit his profound ability as a statesman. In 1795 he resigned his office, and resumed the practice of law in New York, where he was still constantly consulted by Washington and by his cabinet. He was the

actual leader of the Federal (q.v.) party until his death, and was foremost in the fierce party strife of 1801. His successful efforts to thwart the ambition of his personal rival, Aaron Burr (q.v.), finally involved him in a duel with him. Hamilton had reason to regard the practice of duelling with especial abhorrence, but he appears to have felt under an obligation to accept the challenge; and on the morning of 11th July 1804 they met on the west bank of the Hudson, on the same spot where Hamilton's eldest son had received his death-wound in a duel three years before. Hamilton was mortally wounded, and died the next day, leaving the nation his indignant mourners, and his slayer for the time an exile. Hamilton's errors, like his strength, arose largely from his strong, masterful will and passionate nature. The immediate effects of his brilliant services at a crisis in his country's fate endure to this day; his influence is stamped on every page of the American constitution; and his writings still impress the reader by their vigour, their learning, and the maturity of intellect they display. His works, exclusive of *The Federalist*, were edited by his son, John C. Hamilton (7 vols. 1851), who also published a Life (2 vols. 1834–40). See Riethmüller's eulogistic *Hamilton and his Contemporaries* (Lond. 1864), and Lives by Morse (1876), Shea (1879), Henry Cabot Lodge ('American Statesmen,' 1882), and Sumner (1890); Lodge has also edited Hamilton's *Complete Works* (9 vols. 1885).

Hamilton, ANTHONY, COUNT, a cadet of the Abercorn branch of the Scottish family of Hamilton, was born in Ireland in 1646. At twenty-one he went to France, and got a captain's commission; in 1685 he was captain of Limerick, and fought at the Boyne (1690); thereafter he lived at the court of St Germain-en-Laye, and there he died, 6th August 1720. His writings are full of wit and talent, particularly his *Contes de Féerie* (3 vols. Paris, 1805; Eng. trans. 1849). For his *Mémoires du Comte de Grammont*, see GRAMONT.

Hamilton, ELIZABETH, authoress, was born of a Scottish family at Belfast in 1758, and, after residing in various parts of Scotland and in London, died at Edinburgh, 23d July 1816. Her works comprise *Letters of a Hindoo Rajah* (1796); *Memoirs of Modern Philosophers* (1800); *Letters on Education* (1802); *Life of Agrippina* (1804); *Letters on the Moral and Religious Principle* (1806); and the work by which she is best known *The Cottagers of Glenburnie* (1808), a singularly vivid and life-like representation of humble rural life in Scotland.

Hamilton, EMMA, LADY, was born Amy Lyon or 'Hart,' most likely at Ness, in Cheshire, and on 26th April 1763. Her girlhood was passed at Hawarden. She had had three places in London, had borne two children to a navy captain and a baronet, and had posed as Hygeia in a quack-doctor's 'Temple of Health,' when in 1782 she accepted the protection of the Hon. Charles Greville (1749–1809), to exchange it in 1786 for that of his uncle, Sir William Hamilton (1730–1803). After five years at Naples, in 1791 she was married at Marylebone Church to her elderly ambassador, and, returning to Italy, was straightway admitted to the closest intimacy by Maria Caroline, the queen of Ferdinand I. (q.v.). Her 'eminent services' to the British fleet during 1796–98 in furnishing information and procuring supplies were extolled by Nelson, vaunted by herself, as deserving of peerage and pension; but they were much overrated, where, indeed, not purely imaginary. Nelson had first met her in 1793; and gradually Platonic friendship ripened to guilty passion, until, four months after the trio's return to England, she gave birth to a daughter (1801–81), 'our loved Horatia,' so Nelson writes of her in a holograph letter to 'my own dear Wife, in my eyes and the face of Heaven.' Her credulous husband's death, followed four years later by Nelson's, left Emma mistress of good £2000 a year; but by 1808 she was owing £18,000, and in 1813 was arrested for debt. Next year she escaped to Calais, where she died in penury, 15th January 1815. Her grave is obliterated; but her loveliness lives still in twenty-four portraits by Romney, to whom she was ever the 'divine lady.'

See NELSON; HAMILTON, SIR W.; ROMNEY; the spiteful *Memoirs of Lady Hamilton* (1815; new ed. 1891); Paget's 'Vindication' in *Paradoxes and Puzzles* (1874); Jeaffreson's *Lady Hamilton and Lord Nelson* (1888); and Hilda Gamlin's *Emma Lady Hamilton* (1891).

Hamilton, JAMES, an English merchant, born at London in 1769, who, having been taught German at Hamburg in 1798 by an original method, afterwards exchanged mercantile pursuits for the teaching of languages, and taught with great success in the United States (from 1815) and in England (from 1823). He died at Dublin, 16th September 1829. Hamilton discarded grammar, using in its stead a literal word for word translation, placed immediately below the original, line for line alternately. His own account of it is to be found in *The Principles, Practices, and Results of the Hamiltonian System* (Manchester, 1829).

Hamilton, PATRICK, 'the protomartyr of the Scottish Reformation,' was the son of Sir Patrick Hamilton of Kincavel (Linlithgowshire) and Stanehouse (Lanarkshire) and Catherine Stewart, daughter of Alexander, Duke of Albany, second son of James II. Both his parents were illegitimate. The exact date and place of his birth are unknown. Both are approximately settled, however, by the fact that he graduated as Master of Arts in the university of Paris in 1520—the place of his birth being noted as 'the diocese of Glasgow.' As that degree could not be taken at Paris before the age of twenty-one, we may conjecture that Hamilton was born in the last years of the 15th century. It is also unknown where he received the elements of his education. His university studies seem to have been first conducted at Paris, where, about the time of his residence, the opinions of Luther were already beginning to attract attention. It may be considered the most decisive proof that Hamilton was open to the best lights of the time that on leaving Paris he proceeded to the university of Louvain, where in 1517, under the direction of Erasmus, a college was founded for the study of Latin, Greek, and Hebrew. The foundation of such a college at so early a date in the 16th century was a remarkable innovation in university studies, and the students who availed themselves of it were only such as were in ardent sympathy with the new intellectual and religious ideals of the time. In 1523 we find Hamilton at the university of St Andrews, where his sympathies with Lutheranism soon brought him under the suspicion of the church authorities. To escape the fate which afterwards overtook him he returned to the Continent (1527). After a brief stay at Wittenberg, where he probably saw Luther and Melanchthon, he settled for some months in Marburg, the seat of a university lately founded in the interest of the Reformed doctrines. At Marburg Hamilton wrote (in Latin) the only production of his which has come down to us—a series of theological propositions known as 'Patrick's Places.' In these propositions the main doctrines of the Lutheran reformers are stated with such boldness and precision that Knox has embodied them in his history of the Reformation in Scotland. Hamilton returned to Scotland in the autumn of 1527, and shortly afterwards married. The next year he was summoned

to St Andrews by Archbishop Beaton, uncle of the famous cardinal, and on a renewed charge of heresy was burned at the stake before the gate of St Salvator's College, 29th February 1528. His death probably did more to extend the Reformation in Scotland than even his life could have done. 'The reek of Master Patrick Hamilton,' said one of Beaton's own retainers, 'has infected as many as it did blow upon.'

A peculiar interest has always attached to the name of Patrick Hamilton. His winning personal character, his eagerness for all the best light of his time, his courage, and his early death make him one of the most interesting figures in the religious revolution of Scotland during the 16th century. His martyrdom also gave a distinct impulse to the doctrines for which he died; and Knox himself, in the most emphatic manner, testifies to Hamilton's importance in the history of the Scottish Reformation.

See Professor Lorimer's *Patrick Hamilton, the first Preacher and Martyr of the Scottish Reformation* (1857), and Dr David Laing's edition of Knox's *History of the Reformation in Scotland*.

Hamilton, WILLIAM, a Scotch poet, was born in 1704, most probably at his father's estate of Bangour, near Uphall, Linlithgowshire. He contributed to Ramsay's *Tea-table Miscellany* (1724), and joined in the second Jacobite rising. On its collapse he escaped to France, but was permitted to return in 1749 and to succeed to the family estate the year after. He died at Lyons, 25th March 1754. The first collection of his poems was issued, without his consent, by Foulis of Glasgow in 1748; a fuller collection, with a portrait, appeared under the care of his friends in 1760. One of his poems alone—'The Braes of Yarrow'—will keep his name from ever being forgotten, by the depth and truth of its unsought pathos. See James Paterson, *The Poems and Songs of William Hamilton* (1850).

Hamilton, WILLIAM GERARD (1729-96), earned the epithet of 'single-speech Hamilton' by a speech made in the House of Commons, November 13, 1754, as M.P. for Petersfield in Hants—not *quite* the only speech he ever made in the House. For twenty years he was Chancellor of the Irish Exchequer, and was by some regarded as the author of the letters of Junius (q.v.)

Hamilton, SIR WILLIAM, grandson of the third Duke of Hamilton, was born in 1730, and in 1758, after eleven years' service in the Foot Guards, married a beautiful Pembrokeshire heiress, with £5000 a year, who died in 1782, an only daughter having predeceased her. He was British ambassador at the court of Naples from 1764 till 1800, and in 1772 was made a knight of the Bath. During his residence in Italy he took an active part in the excavation of Herculaneum and Pompeii, and formed a rare collection of antiquities, which was afterwards purchased for the British Museum. He was author of several sumptuous works—*Antiquités Etrusques, Grecques, et Romaines, tirés du cabinet de M. Hamilton* (4 vols. Naples, 1766-67); *Observations on Mount Vesuvius* (1772); *Campi Phlegraei* (Naples, 1776-77), &c. He died 6th April 1803. See HAMILTON, EMMA, LADY.

Hamilton, SIR WILLIAM, of Preston, the most learned and scientific philosopher of the Scottish school, was born March 8, 1788, at Glasgow, where his father, Dr William Hamilton, and his grandfather, Dr Thomas Hamilton, held the chairs of Anatomy and Botany. Though the Hamiltons of Preston, in Haddingtonshire, who were raised to a baronetcy in 1673, had not assumed their title since the death of Sir William Hamilton in November 1688, when his brother and heir, Sir Robert, the Covenanter, refused to take the oath of allegiance, the philosopher made good his claim to represent them, and therefore to be descended from the leader of the Covenanters at Bothwell Bridge. After gaining high distinction, especially in the philosophical classes, at Glasgow, he went in 1809 to Balliol College, Oxford, as a Snell exhibitioner. He graduated with first-class honours in 1810; and it was here that he laid the basis of his vast erudition in medieval and modern, as well as in ancient literature. He left Oxford in 1812, and was called to the Scottish bar in 1813; but he seems never to have had any practice in his profession except what became incumbent on him on being appointed crown-solicitor of the Court of Teinds. In 1820, on the death of Dr Brown, he was an unsuccessful competitor for the chair of Moral Philosophy in Edinburgh; in 1821 he was appointed to the professorship of History.

Hamilton had now reached his thirtieth year without giving to the world any indication of those speculations which he had been silently and slowly maturing. But in 1829 there appeared in the *Edinburgh Review* a critique of Cousin's *Cours de Philosophie* of the previous year, in which was developed that philosopher's doctrine of the Infinite. The critique immediately excited admiration both at home and abroad, and for some years after this Hamilton was a regular contributor to the *Edinburgh Review*. Besides other philosophical articles, two of which, on the Philosophy of Perception and on Recent Publications in Logical Science, are especially celebrated, he contributed several papers on education and university reform. Many of these contributions were translated into German, French, and Italian; and in 1852 they were all edited by Hamilton himself, with notes and appendices, under the title of *Discussions in Philosophy and Literature, Education, and University Reform*. In 1836 Hamilton was elected to the chair of Logic and Metaphysics in Edinburgh. During his first session he delivered a course of lectures on metaphysics, which was followed in the succeeding session by a course on logic; and these two courses he continued to read each alternate year till the close of his life. His influence soon began to show itself in the university among the young men who were attracted thither from different parts of Scotland, and other countries, in many cases chiefly for the sake of hearing Hamilton. Extensive notes of his lectures were taken by his students, and numerous copies of them, transcribed from shorthand reports, were in circulation during the later years of his life. After his death these were published under the editorship of Professors Mansel and Veitch (*Sir William Hamilton's Lectures*, 4 vols. 1859-61). These lectures, which were mostly written during the currency of the sessions in which they were first delivered, want the exactness of thought and expression which mark the works revised by himself for publication; and it is to be regretted that the materials embodied in these volumes were not wrought into another work which Hamilton had planned. This was his edition of the works of Reid, with notes and supplementary dissertations. The general aim of Hamilton's whole philosophy is, in fact, but the special aim of this edition of Reid (1846; additional notes from Hamilton's MSS. by Mansel, 1862). His conviction was that the philosophy of Common Sense (q.v.) represents the highest reaches of human speculation; and he accordingly sought in his annotations of Reid's writings, as in his independent works, to point out the relation of the Scottish philosophy to the systems of other countries, as well as to translate it into a more scientific expression. His labour on Reid was interrupted by ill health. By the paralysis of his

whole right side, though his mind continued unimpaired, his power of work was seriously curtailed during the later years of his life. He nevertheless produced a new edition of Dugald Stewart's works in 1854–55; and he was generally able, with an assistant, to perform the duties of his class till the close of session 1855–56, when his health suddenly became worse, and he died 6th May.

Hamilton's system professes to be merely an explication of the Scottish philosophy; it may, however, be questioned whether all his exegetical skill has vindicated the position claimed for Reid, whether, therefore, it would not have been better for Hamilton had he struck into a separate path. For while his philosophy is distinguished in general from previous Scottish speculations by its more rigorously systematic character, it ventures, as in his doctrine of the conditioned, into wholly new realms of thought. This doctrine, which limits positive thought to the conditioned sphere between the contradictory poles of the infinite and the absolute, attracted more attention than any of his other doctrines, especially after the publication of Mansel's *Bampton Lectures* in 1858 (see CONDITION). Hamilton's contributions to logic may be reduced to the two principles (1) of distinguishing reasoning in the quantity of extension from reasoning in that of comprehension, from which issues his twofold determination of major, minor, and middle terms, and of major and minor premises; and (2) of stating explicitly what is thought implicitly; whence were derived the 'quantification of the predicate,' reduction of the modes of conversion to one, and simplifications of the syllogism.

See Life by Veitch (1869); short monographs by Veitch (1882) and Monck (1881); Seth's *Scottish Philosophy* (new ed. 1891); and SCOTTISH PHILOSOPHY in Vol. IX.

Hamilton, SIR WILLIAM ROWAN, one of the few really great mathematicians of the 19th century, was born in Dublin on August 3–4, 1805. From his infancy he displayed extraordinary talents, and at thirteen had a good knowledge of thirteen languages. Having at an unusually early age taken to the study of mathematics, in his fifteenth year he had mastered thoroughly all the ordinary university course, and commenced original investigations of so promising a kind that Dr Brinkley, himself a very good mathematician, took him under his especial patronage. His earlier essays connected with caustics and contact of curves grew by degrees into an elaborate treatise on the *Theory of Systems of Rays*, published by the Royal Irish Academy in 1828. To this he added various supplements, in the last of which, published in 1833, he predicted the existence of the two kinds of conical refraction the experimental verification of which by Lloyd still forms one of the most convincing proofs of the truth of the Undulatory Theory of Light. The great feature of his *Systems of Rays* is the employment of a single function, upon whose differential coefficients (taken on various hypotheses) the whole of any optical problem is made to depend. He seems to have been led by this to his next great work, *A General Method in Dynamics*, published in the *Philosophical Transactions* for 1834. Here, again, the whole of any dynamical problem is made to depend upon a single function and its differential coefficients. This paper produced a profound sensation, especially among continental mathematicians. Jacobi of Königsberg took up the purely mathematical side of Hamilton's method, and considerably extended it; and of late years the dynamical part has been richly commented on and elaborated by mathematicians of all nations, all uniting in their admiration of the genius displayed in the original papers. For these researches Hamilton was elected an honorary member of the Academy of St Petersburg, a rare and coveted distinction. The principle of *varying action*, which forms the main feature of the memoirs, is hardly capable, at all events in few words, of popular explanation. Among Hamilton's other works, which are very numerous, we may mention particularly a very general *Theorem in the Separation of Symbols in Finite Differences*, his great paper on *Fluctuating Functions*, and his *Examination of Abel's Argument concerning the Impossibility of solving the General Equation of the Fifth Degree.*

We may also particularly allude to his memoir on *Algebra as the Science of Pure Time*, one of the first steps to his grand invention of quaternions. The steps by which he was led to this latter investigation, which will certainly when better known give him even a greater reputation than conical refraction or varying action has done, will be more properly treated under QUATERNIONS. On the latter subject he published in 1853 a large volume of *Lectures*, which, as the unaided work of one man in a few years, has perhaps hardly been surpassed. Another immense volume on the same subject, containing his more recent improvements and extensions of his calculus, as well as a somewhat modified view of the general theory, was published after his death, which took place 2d September 1865.

While yet an undergraduate of Trinity College, Dublin, he was appointed in 1827 successor to Dr Brinkley in the Andrews chair of Astronomy in the university of Dublin, to which is attached the astronomer-royalship of Ireland. This post he held till his death. In 1835 he was knighted on his delivering the address as secretary to the British Association for its Dublin meeting. He occupied for many years the post of president of the Royal Irish Academy; he was an honorary member of most of the great scientific academies of Europe. He held during his life, not in Dublin alone, but in the world of science, a position as merited as it was distinguished. See his Life by Graves (3 vols. 1883-89).

Hamilton Group, a subdivision of the upper Devonian strata of New York.

Hamiltonian System. See HAMILTON (JAMES).

Hamlet, the hero of Shakespeare's greatest tragedy, but whether a figure originally historical, mythological, or partly both, still remains uncertain. The legend of Amleth is first found in the third and fourth books of the Latin history of Denmark by Saxo Grammaticus, written about the end of the 12th century, but first printed at Paris in 1514. According to this version, Gervendill, the governor of Jutland under Rörik, king of Denmark, leaves two sons, Horvendill and Fengo. Horvendill for a brave exploit is rewarded with the hand of Gerutha, Rörik's daughter, who bears him a son, Amleth. Fengo murders his brother, and then prevails upon Gerutha to marry him by persuading her that he had done this crime merely out of love for her. Amleth to save his life feigns madness, and is put to some strange tests by his suspicious uncle. He is finally sent to England with two attendants, bearing a sealed letter instructing the king to put him to death, but he contrives to alter the writing so as to procure for them death, and for himself an honourable reception. He next marries the king's daughter, and returns after a year to Denmark, burns down the banqueting-hall, together with its drunken revellers, and slays Fengo with his own sword. He next revisits England, but, as his father-in-law and Fengo had had a secret agreement that the survivor should avenge the other's death if caused by violence, he is sent for his own doom to Scotland to woo the queen

Hermuthruda, who had killed all former suitors. But the terrible queen herself falls in love with the hero, whose final fate is to fall in battle with Vikleins, the successor of Borik. The interest of the story for students of Shakespeare ends with Saxo's third book, which brings it down to the death of Fengo.

The story of Hamlet was freely translated in the fifth volume of François de Belleforest's *Histoires Tragiques* (1570), and a rough but literal English translation of this exists in a single copy (once Edward Capell's) in the library of Trinity College, Cambridge, entitled *The Hystorie of Hamblet* (London, 1608; reprinted in Collier's 'Shakespeare Library,' 1841). Dr Latham in his *Dissertations on Hamlet* (1872) contends that the hero in Saxo's third book is a different personage from that in the fourth, the former being identical with Olaf Kyrre, the Anlaf Cwiran of the *Saxon Chronicle*, and the Amlaf Cuaran of the *Irish Annals*; the latter, with the Hygelac of Beowulf, and the Chocilaicus of Gregory of Tours. Zinzow, *Die Hamletsage* (1877). For the whole question, see Simrock's *Quellen des Shakespeare* (1870), Moltke's *Shakespeares Hamlet-Quellen* (1881), and Hansen's *Legend of Hamlet* (Chicago, 1887).

Hamley, Sir Edward Bruce, K.C.B., lieutenant-general, was born at Bodmin, 27th April 1824, served in the Crimea, was commandant of the staff college in 1870–77, did delimitation work on the Balkan and Armenian frontiers, and commanded the second division at Tel-el-Kebir in 1882 (where Lord Wolseley and he fell out). In 1885–92 he was Conservative member for Birkenhead; and he died 14th August 1893. He wrote on the war in the Crimea (3d ed. 1891); *Wellington's Career* (1860); *The Operations of War* (1866; 4th ed. 1878); and *Voltaire* (1879); besides several clever novels, and other works. See the Life by Innes Shand (1895).

Hamlin, Hannibal, statesman, was born in Paris, Maine, 27th August 1809, practised law from 1833 to 1848, was speaker of the Maine house of representatives in 1837–40, and was returned to congress in 1842. He sat in the United States senate as a Democrat in 1848–57, when he was elected governor by the Republicans, as opposing the extension of slavery to new territories. He was generally in the senate till his death, 4th July 1891; was vice-president under Lincoln, ambassador to Spain, regent of the Smithsonian Institution, and an LL.D.

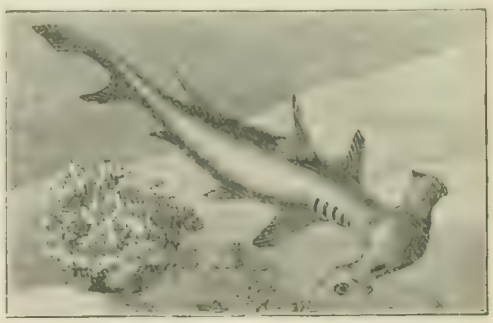
Hamm, a town in Westphalia, on the Lippe, 25 miles NE. of Dortmund by rail, has large metal industries, including iron-foundries, wire-works, manufactories of machines, iron furniture, &c. Pop. (1875) 18,904; (1890) 24,969.

Hammamet, a port of Tunis, on its own gulf, 36 miles SE. of Tunis. Pop. 5000.

Hammer, a tool for beating malleable materials into form or for driving nails, wedges, &c. Often hammers are required of greater weight than a man can wield, and a great variety of power-hammers, masses of iron raised by steam and falling by gravity, are used. The *helve* or *shingling hammer*, used for compressing the mass of iron drawn from the puddling furnace, and the *tilt-hammer*, used in the manufacture of shear-steel, are important examples of such hammers. The first is a heavy bar of cast iron about ten feet long, weighing three or four tons and upwards, to which is attached a head of wrought iron faced with steel, weighing nearly half a ton more. It works upon an axis at the end of the bar farthest from the head, and is raised by cams attached to a heavy wheel set in motion by steam or water power; these cams strike or 'lick' a projection extending beyond the head, and thus raise it about 18 or 20 inches at the rate of from seventy to one hundred times per minute. The tilt-hammer is similar, but much lighter, and is adapted for striking above three hundred blows per minute. In order to attain this velocity a short 'tail' extends with a downward inclination beyond the axis, and the cams strike this downwards, and thus lift the longer arm of the lever to which the head is attached. These, when worked by steam, are, of course, steam-hammers; but when the term steam-hammer is used without qualification, it applies to another and more elaborate machine of very different construction. See Steam Hammer.

Hammerfest, the most northern town of Europe, is situated in 70° 40′ N. lat. and 23° 30′ E. long., on the island of Kvalö, in the Norwegian province of Finmark. It is the rendezvous of the fishing fleets of the Kara Sea and the waters along the Spitzbergen coasts. It imports coal, salt, hemp, flour, &c. in exchange for fish and fish-oil, with some reindeer hides, eider-down, and fox-skins. During the two summer months the sun is continually above the horizon. The winter is mild enough to allow of the fisheries being carried on. The town was burnt, 21st July 1890. Pop. 2289.

Hammer-head, or Hammer-headed Shark (*Zygæna*), a genus of fishes of the family of Sharks, having the general form and characters of the family, but distinguished from all other fishes by the unusual form of the head, which, resembling a double-headed hammer laid flat, extends on both sides to a considerable length, carrying the eyes at the ends of the lateral expansions. The crescent-shaped mouth is below the centre of the head, the nostrils are on the front edge of the head, and the eyes are covered by an eyelid or nictitating membrane. In young specimens the hammer-headed shape is not so well developed as in adults. The hammer-heads bring forth their young alive. In one female, nearly 11 feet long, thirty-seven embryos were found. There are five known species, all of them being most abundant in the tropics. *Z. malleus*, by far the most common form, occurs in nearly all tropical and subtropical seas. In the tropics specimens of this species 'may often be seen ascending from the clear blue depths of the ocean like a great cloud.' Some large ones, one over 13 feet long, have been taken on the British coasts.



Hammer-head (*Zygæna malleus*).

Under side of the head, showing mouth.

Hammer-Purgstall, Joseph, Freiherr von, orientalist, was born at Gratz, 9th July 1774, studied at Vienna, and lived from 1799 to 1806

as interpreter at Constantinople, afterwards becoming a court councillor at Vienna. He was ennobled in 1835 on succeeding by inheritance to the Styrian estates of the Countess von Purgstall, the last of her race. He died at Vienna, 23d November 1856. He had a wide but rather superficial knowledge of Turkish, Arabic, Persian, and other eastern languages, and his industry and zeal did much to push forward the good work of opening up the East to the West. Of his books may be named, in the region of history, *Geschichte der Assassinen* (1818); *Geschichte des Osman. Reichs* (2d ed. 1834-36); *Gemäldesaal Muslim. Herrscher* (1837-39); *Geschichte der Ilchane* (1843); *Gesch. der Chane der Krim* (1856); in that of literary history, *Gesch. der schönen Redekünste Persiens* (1818); *Gesch. der Osman. Dichtkunst* (1836-38); *Litteraturgeschichte der Araber* (1850-57). See Schlottmann's Life (1857).

Hammersmith, a parliamentary borough (since 1885) of Middlesex, is situated on the Thames. A suspension bridge was opened here in 1827, and a new one by Prince Albert Victor in June 1887. The borough returns one member to parliament. Formerly a detached village, Hammersmith is now a large town, and forms part of West London.

Hammock (Spanish *hamaca*, a West Indian word), the apparatus in which a sailor slings his bed. A sailor's hammock consists of a piece of hempen cloth or of strong netting, about 6 feet long and 3 in width, gathered together at each end, and hung to hooks under the deck. Hammocks of netting are often swung from trees in parks and gardens as a pleasant place for idling in fine weather.

Hammond, HENRY, English divine and controversial writer, was born at Chertsey, Surrey, August 18, 1605, and educated at Eton, and Magdalen College, Oxford. In 1633 he was presented to the rectory of Penshurst, in Kent, and ten years later was made archdeacon of Chichester. But his loyal adhesion to the cause of Charles I. cost him his living; yet he officiated as chaplain to the king till his attendants were dismissed in 1647. Hammond then returned to Oxford, and was chosen sub-dean of Christchurch. Deprived by the parliamentary commissioners in 1648, he shortly after retired to Westwood in Worcestershire, where he died April 25, 1660. His celebrated work, the *Paraphrase and Annotations on the New Testament*, was published in 1653 (new ed. 4 vols. 1845). His collected works with biography were published in 4 vols. 1674-84. His *Paænesis* was edited by Manning in 1841. The *Sermons* were reprinted in 1851, the *Minor Theological Works* in 1849, both in the Oxford *Library of Anglo-Catholic Theology*. Bishop Fell's Life (1661) is reprinted in Wordsworth's *Eccles. Biog.*, vol. iv.

Hamoaze. See PLYMOUTH.

Hamoon. See SEISTAN (LAKE OF).

Hampden, JOHN, English statesman and patriot, was the eldest son of William Hampden of Hampden, in Buckingham, by Elizabeth, second daughter of Sir Henry Cromwell of Hinchinbrooke, Huntingdonshire, and aunt of Oliver Cromwell. He was born, it is believed, in London, in 1594. He received his early education at the grammar-school of Thame, and proceeded in 1609 to Magdalen College, Oxford. Four years later he became a student of the Inner Temple, London. But his father's death, when he was only three years of age, had left him the master of a considerable estate, and he does not appear to have practised as a barrister. In 1619 he married Elizabeth Symeon, a lady to whom he was much attached; 'on a sudden,' according to Clarendon, 'from a life of great pleasure and license, he retired to extraordinary sobriety and strictness, to a more reserved and melancholy society.' But, although he became in all essentials a Puritan, he never ceased to be a polished country gentleman. In January 1621 he entered parliament as member for the borough of Grampound, a seat which he subsequently exchanged for Wendover, and at once entered the ranks of the parliamentary opposition, of which the recognised leaders were Pym, Eliot, Oliver St John, and Coke. Although he was no orator—it is believed that in the first five parliaments in which he sat he never opened his mouth—his judgment, veracity, and high character secured for him a leading position in the ranks of his party. In 1626 he helped to prepare the charges against Buckingham; the following year, having refused to pay the proportion of the general loan which Charles attempted to raise on his own authority, he was confined in the Gatehouse and subsequently in Hampshire, to be released on Charles finding it necessary to summon a new parliament. His leading political associates were Pym, whom he regarded as his leader in the House of Commons, and Sir John Eliot, who was his personal friend, and after the interests of whose children he looked at the time that their father was in prison. When Charles dissolved parliament in 1629, Hampden retired to his seat in Buckinghamshire, and gave himself up to the pleasures and duties of a rural life, although he neglected neither his friends, his country, nor his favourite political studies. In 1634 his wife, who had borne him nine children, died. The same year Charles resorted to the impost of ship-money, as an evidence of the right which he claimed to tax the country in any way he chose, and although he confined its incidence at first to London and the maritime towns, in 1636 he extended it to inland places. Hampden refused to pay his share of the impost, and in 1637 he was prosecuted before the Court of Exchequer for non-payment. Seven of the twelve judges sided against him, but, as Mr S. R. Gardiner has said, 'the connection between the rights of property and the parliamentary system was firmly established.' The prosecution also made Hampden the most popular man not only in the ranks of the parliamentary opposition but in England—a position which he never lost, although he still played a secondary part to Pym in the House of Commons. He was a member both of the Short Parliament, which opposed Charles and Strafford in connection with the war with Scotland, and of the much more memorable Long Parliament, for which he was returned by the electors both of Wendover and of Buckinghamshire, although he elected to sit for the county. He had indeed not a little to do with giving this remarkable body its character, as before the election took place he rode from county to county exhorting the electors to give their votes to men worthy of their confidence.

Hampden at once took a foremost place in the new House. 'The eyes of all men were fixed upon him,' says Clarendon, 'as their *patriæ pater*, and the pilot that must steer the vessel through the tempests and rocks which threatened it.' He took part in almost all the leading transactions of the Long Parliament, especially in the action which ended in the death of Strafford, although he seems to have been of opinion that proceeding by bill was unnecessary, and that the better course would have been to obtain judgment on the impeachment. Had the abortive negotiations between Charles and the leaders of the opposition come to anything, it is understood that the post of tutor to the Prince of Wales would have been offered to Hampden. Still he had never any faith in the king, and when, through the formation of a party of constitutional royalists in the Commons itself with Lord

Falkland at its head, it seemed not impossible that Charles would be able to crush the liberties of his country. Hampden, like his relative Cromwell, meditated self exile to New England, not for the first time in the course of his public life. In the debate on the address to the king, known as the Grand Remonstrance, it was the calmness of Hampden which prevented the two parties in the House from fighting on its floor. He was one of the five members, Charles's attempt to seize whom, when engaged in the discharge of their parliamentary duties on January 4, 1642, precipitated the Civil War.

When hostilities broke out, Hampden subscribed £2000 to the public service, took a colonel's commission in the parliamentary army, and raised a regiment of infantry in his own county of Buckingham. He attended to his military as to his parliamentary duties with energy and promptitude, and on various occasions, as at the battle of Edgehill and the assault and capture of Reading, he exhibited both personal bravery and generalship. He was, however, placed under Essex, and although he protested against his chief's hesitation, he was powerless to avert its consequences. He heartily approved of, and to a certain extent anticipated, the suggestions made by Cromwell which ultimately resulted in the conversion of the parliamentary forces, under the designation of the 'new model,' into an invincible army. On the 18th June 1643, while endeavouring, on Chalgrove Field, near Thame, to check a marauding force under the command of Prince Rupert, he was struck in the shoulder by two balls. He was able to reach Thame, and there he lingered till the 24th. Hampden has left behind him the reputation of being the most moderate, tactical, urbane, and single minded of the leaders of the Long Parliament, while inferior to none in resolution or sincerity. He showed before his death such capacity both as a statesman and a soldier as to justify Macaulay in predicting that if he had lived he would have been the Washington of England.

The standard biography of Hampden is Lord Nugent's *Memorials of Hampden* (1831). Among the numerous works in which he forms a prominent figure are Clarendon's *History of the Rebellion* 1702 4); S. R. Gardiner's *History of England* and *History of the Great Civil War* (1883 89); and John Forster's *Arrest of the Five Members* 1860 and *Sir John Eliot* (2 vol. 1871). See also Chillern Hills; and for reasons for rejecting the commonly accepted account of his death, see two letters by C. H. Firth in the *Academy*, November 2 9, 1889.

Hampden, Renn Dickson, theologian and bishop, was born in Barbadoes in 1793, studied at Oriel College, Oxford, taking a double first in 1813, and becoming in due course Fellow and tutor of his college. In 1832 his famous Bampton lectures on the *Scholastic Philosophy considered in its Relation to Christian Theology* were by great part of the church considered grievously heretical, and raised a controversy that threatened to break up the Church of England. His successive appointments to the principalship of St Mary's Hall (1833), the chairs of Moral Philosophy (1834) and of Divinity (1836), were denounced alike by the Evangelical and High Church parties, and his elevation to the see of Hereford in 1847 was by them regarded as a death-blow to Trinitarian religion. Yet Bishop Hampden's works may now be regarded as innocent and edifying. After an episcopate of studious quiet, he died at London, 23d April 1868. Of his books may be named his *Work of Christ and the Spirit* (1847), *Lectures on Moral Philosophy* (1856), and *Fathers of Greek Philosophy* (1862). See H. Hampden's *Some Memorials* (1871), and, for the Hampden controversy, Stanley's *Life of Arnold*.

Hampole, Richard Rolle, known as the Hermit of Hampole, was born about 1290 at Thornton in Yorkshire. Sent to Oxford by Neville, archdeacon of Durham, he made great progress in his studies, and at nineteen assumed a hermit's dress, and gave his life entirely to the austerities of religion and to writing, down to his death in 1349, when he was buried in the Cistercian nunnery of Hampole near Doncaster. He wrote religious books both in Latin and in English, and rendered the Psalms into English prose. His great work is *The Pricke of Conscience* (*Stimulus Conscientiæ*), a poem written both in English and Latin. The English version contains 9624 lines on the instability of life, death, purgatory, doomsday, the pains of hell, and the joys of heaven. It was edited by Dr Richard Morris in 1863 for the Philological Society. A small collection of Hampole's prose pieces was edited by the Rev. G. G. Perry for the Early English Text Society in 1866. See also the papers by J. Ullmann in vol. vii., and G. Kribel in vol. viii., of *Englische Studien*, and Horstmann's monograph (1895).

Hampshire, Hants, or, officially, the county of Southampton, a maritime county in the south of England, is bounded W. by Dorset and Wilts, N. by Berks, E. by Surrey and Sussex, and S. by the English Channel. The county, including the Isle of Wight, has an area of 1621 sq. m., or 1,037,764 acres, 700,000 of which are generally under culture. Pop. (1801) 219,290; (1841) 354,682; (1861) 481,815; (1881) 593,465; (1891) 690,086. The surface is diversified by the North and South Downs, the loftiest points being Sidown Hill (940 feet), and, on the Berkshire border, Inkpen Beacon (1011 feet), the highest chalk-down in England. The south-western portion of the county, almost wholly detached from the main portion by the Southampton Water, is occupied mainly by the New Forest, 92,365 acres in extent, the property of the crown. In the south-east and east there are remains of the forests of Bere, Woolmer, and Waltham Chace. The principal rivers are the Test, the Itchen, and the Avon, all flowing southward; the last named forms the western boundary of the New Forest. The climate of the county is in general mild, and favourable to vegetation; indeed, in the south of the Isle of Wight it is believed to be milder than in any other portion of Great Britain. All the usual crops are produced, the wheat being especially good as a rule; hops are cultivated; and the bacon cured here is famous. The Downs afford pasturage for an excellent breed of sheep. Honey is a speciality of the county. The manufactures are inconsiderable, except at Portsmouth and Gosport. Southampton and Portsmouth, both termini of important railways, are the chief centres of trade. The county, exclusive of the parliamentary boroughs of Portsmouth, Southampton, Winchester, and Christchurch, and the Isle of Wight, returns five members for its five divisions —North or Basingstoke, West or Andover, East or Petersfield, South or Fareham, and New Forest. The county council consists of 100 members. Hampshire is wholly in the diocese of Winchester. Towns other than the four boroughs are Aldershot, Alton, Andover, Basingstoke, Bishops Waltham, Bournemouth, Farcham, Gosport, Havant, Lymington, Petersfield, Ringwood, Romsey, and Titchfield. The chief edifices in the county possessing historical or architectural interest are those at Winchester (q.v.); Porchester Castle, at the head of Portsmouth Harbour; Carisbrooke Castle in the Isle of Wight; Calshot and Hurst Castles, now occupied as coastguard stations, erected in the time of Henry VIII.; Netley and Beaulieu Abbeys, and the Priory of St Denis, all in the neighbourhood of Southampton. Hampshire is exceedingly rich in Roman remains. Among

Hampshire's worthies have been Jane Austen, Walter Besant, Charles Dickens, William Gilpin, Keble, Kingsley, Archbishop Warham, Gilbert White, William of Wykeham, and Edward Young. See ISLE OF WIGHT, NEW FOREST; and the histories by Woodward (1861–69) and Shore (1892).

Hampshire Basin. See EOCENE SYSTEM.

Hampstead, a parliamentary borough of Middlesex, is finely situated on a range of hills 4 miles NW. of London. It was formerly famous for its medicinal springs, and is still a favourite place of residence and of holiday resort among Londoners, who are attracted to it by the beauty of its situation and the purity of its air. On the summit of the hill (430 feet), above the village, is the Heath, which affords extensive and pleasant prospects of the surrounding country. A house on the Heath, formerly called the Upper Flask Inn, and now a private residence, was at one time the place of resort of the famous Kit-Cat Club, at which Steele, Addison, Richardson, Walpole, and others used to assemble. Hampstead is associated with many names in literature and art, as those of Pope, Gay, Johnson, Akenside, Joanna Baillie, Byron, Constable, Romney, Coleridge, Keats, Shelley, Leigh Hunt, and Landseer. The borough returns one member. Pop. 68,425. See Howitt's *Northern Heights of London* (1869), and works by Lobley (1889) and Baines (1890).

Hampton, a village of Middlesex, on the Thames, 15 miles SW. of London. In the vicinity are many fine mansions and beautiful villas, including Garrick's villa. Pop. 4776.

HAMPTON COURT PALACE, long a royal residence, and now partially occupied by persons of good family in reduced circumstances, stands about a mile from the village in the midst of grounds that extend to the Thames. The original palace was erected by Cardinal Wolsey, and by him presented (1526) to Henry VIII., who enlarged it and formed around it a royal deer-park. Here Edward VI. was born, his mother, Queen Jane Seymour, died, and Charles I. underwent a portion of his confinement. Here too was held in 1604 the famous conference between the bishops and the Presbyterians. It continued to be a royal residence down to the time of George II. A considerable portion of it was rebuilt by William III., from designs by Wren, and he also laid out the park and gardens in the formal Dutch style. The picture-gallery contains several Italian works, Lely's Beauties of the Court of Charles II., and valuable specimens of Holbein, Kneller, West, &c. The cartoons by Raphael have been removed to the South Kensington Museum. The gardens present a series of raised terraces, formal flower-plots, and long and shady arcades, and have among other attractions a 'maze' or Labyrinth (q.v.). Damage, estimated at £20,000, was caused by fire in November 1886. See Ernest Law, *Hampton Court in Tudor, Stuart, Orange, and Guelph Times* (3 vols. 1885-91).

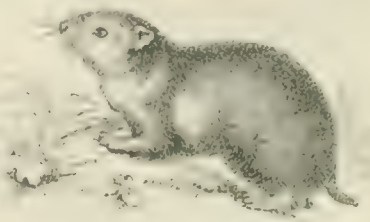
HAMPTON COURT CONFERENCE, a conference which took place at Hampton Court shortly after the accession of James I. to the throne of England, in order to the settlement of ecclesiastical disputes. Of the divines summoned the representatives of the High Church party were more numerous than the Puritans; the Puritans were among the least extreme of their party. Archbishop Whitgift, with eight bishops, six deans, and an archdeacon, appeared on the High Church side; two Oxford professors of divinity, two divines from Cambridge, and along with them Patrick Galloway, minister of Perth, maintained the Puritan cause. On the king's accession the Puritans, entertaining great hopes of release from the rigid enforcement of ceremonies which galled their consciences, and of the reformation of abuses in the church, had addressed a petition to the king, known as the *Millenary Petition*, because it was signed by nearly one thousand ministers in all parts of the country. But the king's intention was not to comply with their wishes, and the Hampton Court Conference seems to have been merely a device for making it appear that their demands had been considered and found unreasonable. On the first day of the conference (12th January 1604) the High Church representatives alone were admitted to the presence of the king, who demanded their opinion, which they gave on the third day after, in favour of the existing system in all the parts complained of. On the 16th of January the Puritans were called to the king's presence, but along with them some of their opponents, when James debated keenly against the Puritans, and, according to his own account of the matter, 'peppered them soundly.' On the 18th of January both parties were called in, and the royal judgment intimated, which was afterwards announced in a proclamation very adverse to the Puritans. See S. R. Gardiner's *History of England*.

Hampton, a town and bathing resort of Virginia, giving name to Hampton Roads, a channel between Chesapeake Bay and the estuary of James River. The town contains a normal institute for coloured pupils. The channel, which is defended by Fortress Monroe, was the scene of several naval actions during the civil war. Pop. 2684.

Hampton, WADE, an American soldier, was born in South Carolina in 1754, served in the revolutionary war under Marion and Sumter, was twice elected to congress, and in 1809 became brigadier-general. In 1813, now a major-general, he made an unsuccessful attempt to invade Canada. He afterwards became wealthy by land speculations, and at his death in 1835 was said to own 3000 slaves.—His grandson, WADE, born in Columbia in 1818, was a state senator when the civil war began. He raised a force of infantry, cavalry, and artillery, known as 'Hampton's Legion,' and served at Bull Run and in the Peninsular campaign. As brigadier-general, he commanded a cavalry force in the Maryland and Pennsylvania campaigns in 1862–63, and was severely wounded at Gettysburg. He received the command of Lee's cavalry in 1864, with the rank of lieutenant-general; and in 1865 he served in South Carolina against Sherman. He was elected governor of his state in 1876, and United States senator in 1878 and 1884.

Hamster (*Cricetus*), a genus of rodent mammals of the family Muridæ, characterised by a stoutish body, short legs and tail, cheek-pouches reaching back almost to the shoulders, five toes on the hind-foot and four toes and a thumb-wart on the fore-foot. Two incisor teeth are present in each jaw (as usual in rodents), the upper ones yellow and undivided; there are three molar teeth on either side in each jaw, which have true roots, the foremost the largest. The stomach has two divisions, and there is a large cæcum. There are nine species, of which the most important is the Common Hamster (*Cricetus vulgaris*), distributed from the Rhine to the middle of Siberia, and from 60° N. lat. to the Caucasus. It is about 1 foot in length (2 inches being occupied by the tail, which is slightly hairy); yellowish-gray above, black below, with several yellowish-white patches on the side, and with white feet. It breeds twice in the year, and from four to sixteen young are produced each time, which are born blind. The males especially are very pugnacious, and will defend themselves courageously to the last gasp. During

the winter the hamster hibernates, living upon its store of food. Each individual makes a burrow for itself, to which there is a vertical entrance and a sloping passage for exit. The sleeping apartment is always separate from the storehouse, of which young hamsters only make one, older ones several.



Hamster (*Cricetus vulgaris*).

It lives upon roots, grain, and fruits, but does not disdain to eat frogs, beetles, or worms. During the summer it lays up a store of grain and pulse, which it carries home during the night in its cheek-pouches. Only the nutritive portions of its booty are stored up, the husks and chaff being rejected; sometimes the amount of its hoard will reach nearly a hundredweight. Hence it is a great pest to the farmers of the countries in which it abounds, and the object of their unceasing hostility. The skins of hamsters are of some value.

Hanaper Office, an office of the Court of Chancery, from which certain writs were formerly issued. The name is derived from the fact that the papers and writs used to be kept in a hamper (*an hanaperium*). The Comptrollers of the Hanaper were abolished in 1842.

Hanau, a town in the Prussian province of Hesse-Nassau, is situated at the confluence of the Kinzig and the Main, 13 miles E. by N. of Frankfort by rail. It is divided into the Old and the New Town; the latter was founded in 1597 by Protestant refugees from Holland and Belgium, who introduced the manufacture of woollen and silk goods, which still flourishes. The town of Hanau stands pre-eminent in Germany for its jewelry and gold and silver wares. Besides these it carries on manufactures of carpets, chocolate, leather, cards, paper, hats, tobacco, and gunpowder, and has breweries and an iron-foundry. Here the brothers Grimm were born. In the neighbourhood is the watering-place of Wilhelmsbad. Hanau dates as a town from 1393. It had a very chequered history during the Thirty Years' War. Near the town was fought one of Napoleon's last battles in Germany, October 30 and 31, 1813, when he defeated the allied Austrians and Bavarians under Wrede. Pop. (1875) 22,269; (1890) 25,029.

Hancock, Winfield Scott, a distinguished American general, was born at Montgomery Square, near Philadelphia, 14th February 1824. His grandfather was a Scotsman, his father an attorney of good position. He graduated at West Point in 1844, served with merit through the war with Mexico, and had reached the rank of captain when the civil war broke out. Commissioned in 1861 brigadier-general of volunteers, he did good service in organising the army of the Potomac, and was prominent in the battles of South Mountain and Antietam; at Fredericksburg, as major-general of volunteers, he led 5000 men to the desperate assault on Marye's Heights through a deadly fire from which less than 3000 came back. In June 1863 he was given the command of the 2d corps. At Gettysburg, Hancock was in command until Meade's arrival; and on 3d July he was severely wounded, but remained on the field until the enemy's last determined assault was repulsed by his corps. In 1864 he was conspicuous in the hard-fought battles of the Wilderness, Spottsylvania, and Cold Harbor; at Spottsylvania he captured nearly an entire division, and carried a salient of field-works on the Confederate centre, afterwards known as the 'bloody angle,' which, with the help of the 6th corps, he held against Lee's desperate assaults. For this, and his services afterwards under Grant, he was created brigadier-general in the regular army, 12th August 1864. His wound now broke out again, and thereafter, while the war continued, his energies were directed mainly to the work of organisation. In 1866 he was promoted to major-general, and assigned to the command of the department of the Missouri, where he was for a time employed against the Indians. He was then transferred to the South, and in 1868 to the division of the Atlantic. To this post, after three years' command in Dakota, he was restored in 1872, and filled it till his death. He was the Democratic candidate for the presidency of the United States in 1880, but was defeated by Garfield (q.v.). He died on Governor's Island, in New York harbour, 9th February 1886. Grant has written, 'Hancock stands the most conspicuous figure of all the general officers who did not exercise a separate command.' McClellan called him 'superb,' and the title stuck to him. He was a brave, fearless soldier, prompt in decision, and skilled to command; but one who would rather lead than send his troops forward, and whose presence in the thickest of the fight won him their confidence. See the Lives by Junkin and Norton (1880), Goodrich (1886), Walker (1890), and the *Reminiscences* of him by his widow (1887).

Hand. The. The genus *Homo*, or Man, was ranked by Cuvier in his classification of mammals as a distinct order, Bimana, in consequence of man being the only animal possessing *two hands*. Recently the tendency has been to revert to the classification of Linnæus, and to place man with all monkeys, lemurs, and bats in the order Primates (see Bimana, Mammalia). At first sight it might be considered that the so-called Quadrumana or four-handed animals (monkeys, &c.) were better equipped than those which possess only two hands, but this is far from being the case. None of the four hands are adapted to the variety of actions which the human hand is capable of performing, and they are all, to some degree, required for support and locomotion; so that, while in the higher

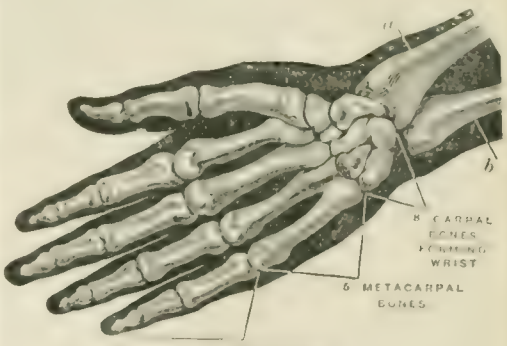


Fig. 1.—Front view of the Bones of right hand
a, radius; b, ulna.

forms of the quadrumana the extremities present an approximation in structure to those of man, in the lower they gradually tend to resemble the ordinary quadrupedal type. 'That,' says Cuvier, 'which constitutes the *hand*, properly so called, is the

faculty of opposing the thumb to the other fingers, so as to seize upon the most minute objects—a faculty which is carried to its highest degree of perfection in man, in whom the whole anterior extremity is free, and can be employed in prehension.' The peculiar prehensile power of the human hand is chiefly dependent upon the length, power, and mobility of the thumb, which can be brought into exact opposition to the extremities of all the fingers, whether separately or grouped together.

The general arrangement of the bones of the hand will be understood by a reference to fig. 1.

In fig. 2 we have a diagram showing the way in which the bones of the hand are arranged. The carpal bones (3 to 10 in the figure) are eight in number, and are arranged in the wrist in two rows. The first or upper row consists practically of three bones (3, 4, 5), the fourth (6) being regarded as belonging to the class of *Sesamoid Bones* (q.v.), and the second row of four bones (7, 8, 9, 10); so that, excluding the pisiform bone (6), the carpal and the tarsal bones correspond in number. As we commonly term the palm the *front* of the hand, the thumb becomes conventionally the *outer*, and the little finger the *inner* digit; but according to the rules of comparative anatomy, and in order to compare the hand and foot, we ought to reverse these terms. The outer (3) of the carpal bones of the first row supports (through the intervention of 7 and 8) the bones of the thumb and forefinger (I and II), and constitutes with them the *outer* division of the hand. The inner (5) of the carpal bones bears the little and the next (the ring) finger (V and IV), and constitutes with them the *inner* division of the hand, while the middle one (4) bears the middle finger (III), and belongs to the *middle* division of the hand. We likewise see from this figure, and also from fig. 1, that the two outer bones (3 and 4) are connected with the radius, while the inner bone (5) is connected (indirectly by a thick ligament) with the ulna.

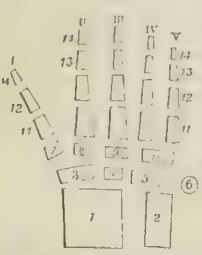


Fig. 2.—Diagram of the Bones of the Hand, with the ends of the Radius and Ulna (after Humphry):

1, end of radius; 2, end of ulna; 3, scaphoid; 4, semilunar; 5, cuneiform; 6, pisiform; 7, trapezium; 8, trapezoid; 9, magnum; 10, unciform; 11, 11, metacarpal bones; 12, 12, first row of phalanges; 13, 13, second row; 14, 14, third row; I, thumb; II, forefinger, &c.; V, little finger.

The carpal bones are so arranged that the carpus presents a dorsal convex surface, upon which the tendons of the extensor muscles of the fingers play, and a palmar concave surface on which the tendons of the flexor muscles lie. The several bones are joined to one another—each bone being united to three or more others—by a large extent of surface, and are girded together by strong ligamentous bands. The wrist is thus as strong as if it had been constructed of one solid piece of bone, while the slight gliding movements which occur between the several bones give it an elasticity which serves to break the shocks that result from falls upon the hand. The uppermost surface of the first row of carpal bones is convex, and this convex surface is received into a wide cup or socket, formed by the lower articular surface of the radius and by a ligament passing from that bone to the ulna. Like the great toe, the thumb has only two phalanges, while each of the other digits has three.

For the different directions in which the arm and hand collectively can be moved, see the description of the construction and movements of the shoulder and elbow joints at ARM. Movements of the forearm and hand, to which there is virtually nothing analogous in the leg, are those of 'pronation and supination.' In *pronation* (derived from *pronus*, 'with the face downwards') we turn the palm of the hand downwards, as in picking up any object from the table; in *supination* (derived from *supinus*, 'with the face upwards'), we turn the palm upwards, as for the purpose of receiving anything that may be placed in it.

These movements of pronation and supination are so important to the usefulness of the hand that we must notice the muscles by which they are chiefly effected. One of these muscles passes from a projecting process on the inner side of the arm-bone at its lower end to the outer edge of the middle of the radius. Its contraction causes the radius to roll over, or in front of, the ulna. It thus pronates the hand, and is called a *pronator* muscle. Another crosses from the front of the lower end of the ulna to the corresponding part of the radius. Its shape and its action are indicated by the name *pronator quadratus*. Another muscle passes from a projecting process on the outer side of the arm-bone and from the outer aspect of the ulna to the outer surface of the radius near its upper part. It runs therefore in an opposite direction to the former muscle, and produces an opposite effect, rolling the radius and the hand back into the position of supination. Hence it is called a *supinator* muscle (see fig. 3). The fourth is a very powerful muscle termed the *Biceps* (q.v.), which not only bends the elbow, but, from the mode in which its tendon is inserted into the inner side of the radius, 'also rotates the radius so as to supinate the hand; and it gives great power to that movement. When we turn a screw, or drive a gimlet, or draw a cork, we always employ the *supinating* movement of the hand for the purpose; and all screws, gimlets, and implements of the like kind are made to turn in a manner suited to that movement of the right hand, because mechanicians have observed that we have more power to supinate the hand than to pronate it.' Supination can only be performed to its full extent by man, and even in man it is not the natural or habitual position; monkeys can partially effect the movement, and in most of the lower animals the part corresponding anatomically to the hand is constantly in a state of pronation.

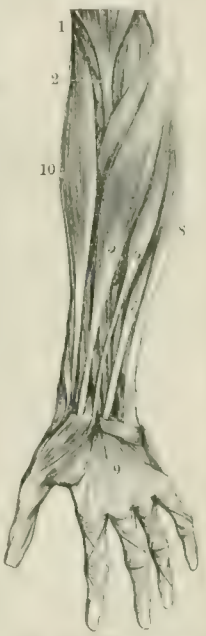


Fig. 3.—The superficial Muscles of the Forearm:

1, biceps; 2, tendon of biceps; 5, the radial flexor of the wrist; 6, the long palmar muscle, spreading out at 9 into the palmar fascia; 8, the ulnar flexor of the wrist; 10, the long supinator muscle.

The movements of which the hand itself, without reference to the arm, are capable, are very numerous, and in this respect differ considerably from the corresponding movements of the foot. Thus we can bend the fingers down upon the palm, or we can extend them beyond the straight line; we can separate them from one another to a considerable extent, and we can close them with considerable force. The wrist and hand are bent forwards or flexed upon the forearm by three muscles which pass downwards from the inner

condyle or expanded end of the humerus, and are termed the *radial flexor*, the *ulnar flexor*, and the *long palmar* muscles. The first two of these muscles are inserted into wrist bones on the radial and ulnar sides respectively, while the third expands into a fan-like *fascia* or membrane in the palm of the hand, and thus serves both to support the skin of the palm and to protect the nerves and vessels which lie below it. Beneath the palmar fascia lie two sets of *flexor* muscles of the fingers, and they present so beautiful a mechanical arrangement as to merit special notice.

The *superficial* or *perforated flexor* muscle passes down the front of the forearm, and divides into four tendons, which become apparent after the removal of the palmar fascia, and are inserted into the second phalanges of the fingers, each tendon splitting at its termination, to give passage to the similar tendons of the *deep* or *perforating flexor* muscle, which passes from the upper part of the ulna to be inserted into the last phalanx of each finger. This arrangement of the tendons of the superficial and deep flexor muscles is shown in fig. 4. To these *flexor* muscles

Fig. 4.

To show the perforation of one of the tendons of the superficial flexor muscle (which is inserted into the second phalanx), in order to allow the corresponding tendon of the deep flexor to pass onwards to be inserted in the last phalanx.

correspond the *common extensor* muscle of the fingers, which, like the flexors, divides into four tendons, one for each finger. Besides these, there is a special *extensor* of the index finger, a series of muscles forming the ball of the thumb, which move that organ in almost every direction, and various small muscles giving lateral and other movements to the fingers.

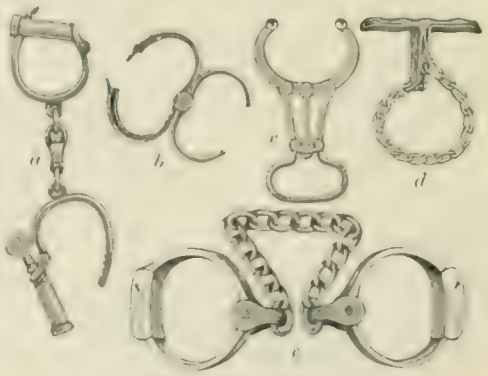
It is sufficient to observe that the hand is very richly supplied with blood-vessels and nerves, without entering into any anatomical details on these points. There is no part of the body where the sense of touch is so acute as at the tips of the fingers; but we defer to the article TOUCH the consideration of the special arrangements which make this part of the hand peculiarly important in relation to our knowledge of external objects.

As a measuring standard for the height of horses a hand is a palm-breadth, assumed to be four inches. For left handedness, &c., see RIGHT AND LEFT HANDEDNESS.

Our notice of the comparative anatomy of the Foot (q.v.) renders it unnecessary to trace the modifications presented in the lower animals by the bones corresponding to those of the human hand, as the carpal and metacarpal bones with their phalanges undergo adaptations of form to meet the individual wants of the animal, very much in the same manner as the tarsal and metatarsal bones and their phalanges. Thus, the reader will readily see that the so-called knee of the horse, for example, is the carpus, and he will have no difficulty in tracing the metacarpal bones and phalanges. See Sir Charles Bell, *The Hand, its Mechanism and Vital Endowments* (Bridgewater Treatise, 1836; 9th ed. 1874).

Handcuffs, the instruments used for securing prisoners under arrest. In the 15th and 16th centuries they are spoken of as *swivels*, *manacles*, and *shackbolts*. Until within the latter half of the 19th century, those in common use seem to have been only of two kinds—viz. the rigid or figure-8 handcuffs, employed chiefly in prisons for the punishment or restraint of refractory or violent prisoners, and the flexible or chain handcuffs used by the police and military when conveying a person in custody from one place to another. With the former the wrists are so confined as to be fixed in one position either in front or behind the body of the prisoner, the latter method being the one generally adopted when they are put on for infraction of prison regulations. This punishment is a much dreaded one, the confinement of the wrists together at the prisoner's back even for a short period being exceedingly irksome and uncomfortable. The chain handcuff, which is in most common use, is made so that, while depriving the prisoner of the free use of his hands and arms, a change in the position of these to some extent is permitted, and the rigidity of the figure-8 handcuffs is avoided. Of recent years several improvements have been made in the construction of the handcuffs. They are much lighter, and many of them are now adjustable (*a* in fig.). By means of a *ratchet* arrangement they are made to fit any size of wrist, and the difficulty which was formerly met by an officer taking two or three pairs of different sizes with him when going a distance to bring a prisoner has thus been overcome. For the removal of gangs of prisoners from one prison to another a long chain is used, running through and connecting the handcuffs by which each prisoner is secured. Gangs of eight or ten men are thus fastened together, the chain passing through a ring fixed on each handcuff, and made fast at both ends by what are known as *end locks*.

In addition to the handcuffs above described there are several appliances, mostly of recent invention, which are employed by the police in securing prisoners, but which are not known among the officers of the law as handcuffs. They



Various forms of Handcuffs

have a variety of names—such as *snaps* (*b* in fig.), *nippers* (*c* in fig.), *twisters* (*d* in fig.), &c. They are distinguished from the handcuffs by the fact that they are intended only for one wrist, the other part or handle being held by the officer conveying the prisoner. They are mostly of American origin, their chief design being to enable an offender to be instantaneously secured, and thus prevent attempts to resist capture. The *snap* is the one most in use in Great Britain among detective officers; the smaller loop is slipped on the wrist of the offender, and the fastening is snapped into place and held in the hand of the detective; in an emergency this instrument is very effective when used as a knuckle-duster. In the United States and the colonies the *nippers* are recognised as the most effectual for

prompt operation; by an ingenious arrangement of the centre-bar, shown in the fig., it can be instantaneously fastened by one hand on the wrist of an offender. The *twister* is now generally forbidden in Great Britain, instances having arisen in which its application has been attended with serious injury to the prisoner; but it is still frequently used in some parts of America and in other countries where open resistance to the law is of more frequent occurrence. It is composed of a chain attached to two handles. The chain is put round the wrist, the handles brought together and twisted till the chain grips tight enough. In cases where prisoners have to be removed who are charged with crimes of a desperate kind, the culprit is occasionally secured by leg-irons (*e* in fig.) in addition to the handcuffs, and these are also used in convict establishments upon prisoners who have shown themselves to be dangerous. The leg-iron is fastened above the ankle and locked by a key.

Handel, GEORGE FREDERICK, born at Halle, in Saxony, at No. 4 of the Grosser Schlamm, February 23, 1685. The German name was Georg Friedrich Händel (pronounced Hendel); but he himself signed G. F. Handel to the end of his life. His father (then sixty-three) was a surgeon; his mother the second wife. His passion and ability for music began from the first, but against his father's will. At seven or eight the boy was placed under Zachau, organist at Halle, and in about a year was writing a regular composition every week, besides playing organ, clavier, violin, and hautboy. In or about 1696 he was sent to the court of Berlin, where he met Ariosti and Buononcini the composers. In 1697 his father died, but his education was carefully continued, and on February 10, 1702, he entered the university of Halle, and in the same year became organist of the church at the Moritzburg there. Before this time he was well known as a musician. In 1703 he went to Hamburg, then one of the most musical towns in Germany. Here he played second violin in the opera orchestra, accompanied on the theatre harpsichord, made all the music and enjoyed all the life possible. Among musical houses which he frequented was that of Sir Cyril Wich, English representative. In Holy week, 1704, he produced his first *Passion*. In December he had a duel with his friend Mattheson, nearly fatal, though the difference was soon adjusted; and in January 1705, *Almira*, his first opera, was brought out, and was followed by *Nero*, *Florindo*, and *Daphne* all in German. He also gave innumerable lessons, and wrote much harpsichord music. In the summer of 1706 he left Hamburg, and in January 1707 we find him at Florence, in April at Rome, and in July back at Florence, producing *Rodrigo*. The first three months of 1708 he spent at Venice, and produced *Agrippina*: thence he went to Rome for another three months, and thence to Naples, possibly till Christmas 1709—the whole journey one continued triumphal progress, both in playing and composition. He then returned to Florence, and finished his visit at Venice in the middle of 1710.

He returned by Halle to Hanover, and was made Kapellmeister, with an income of 1500 crowns, and leave to travel. Thence he went by Düsseldorf to London, where he arrived in November 1710. His first opera, *Rinaldo*, was produced at the Queen's Theatre, Haymarket, February 24, 1711, with prodigious success. After this he returned to Hanover, and remained in Germany till the autumn of 1712, when he went back to London. That winter he produced *Il Pastor Fido* and *Teseo*. The spring of 1713 saw his first composition to English words, the first *Birthday Ode*, and the *Utrecht Te Deum*. During this time he lived chiefly with Lord Burlington at his house in Piccadilly. On August 1, 1714, Queen Anne died, and on September 18 George I. arrived. The operas of this year were *Silla* and *Amadigi*. The king was naturally displeased at Handel's long absence from Hanover, and perhaps at his writing a *Te Deum* for Utrecht; but Handel made his peace by the *Water Music*, written for a royal water-party, August 22, 1715. He received a pension of £200, to which were afterwards added two other amounts of £200 each, giving him a permanent income of £600, representing considerably more than the same sum at present. In July 1716 he accompanied the king to Hanover, and returned with him in the following January. While there he wrote his second German *Passion*. In 1718-19 no operas were performed, and Handel was engaged by the Duke of Chandos to direct the music at his palace at Cannons, near Edgware. Here he wrote the twelve *Chandos Anthems* and two *Te Deums* (in B flat and A), *Esther*, *Acis and Galatea*, and the first set of *Lessons*, containing the 'Harmonious Blacksmith.'

In 1720 the Royal Academy was founded in the Haymarket, by subscription of £50,000, 'to secure a constant supply of operas by Handel, to be performed under his direction.' This was the beginning of the great revolution which for a hundred years and more kept English music, once so strong in its native school, under the dominion of foreigners. As director, Handel had been to Dresden early in 1719, and had engaged Senesino and others. Bach travelled thither to see him, but missed him by one day. The Royal Academy Theatre opened April 2, 1720, and Handel's *Radamisto* was produced. Thirteen other operas are spread over the next eight years—*Muzio Scevola* (Act 3 only composed by him), *Floridante*, *Ottone*, *Flavio*, *Giulio Cesare*, *Tamerlano*, *Rodelinda*, *Scipione*, *Alessandro*, *Admeto*, *Riccardo*, *Siroe*, *Tolomeo*. During this time he was naturalised, February 13, 1726. In June 1727 George II. succeeded to the throne, and as court composer Handel composed *Zadok the Priest*, and three other anthems, for the coronation. On June 1, 1728, the theatre closed, and, the money being all spent, the Royal Academy of Music was at an end. Handel and Heidegger then took the house on their own account, and shortly after Handel set out to find singers in Italy. On June 29 he was at Halle with his mother, then suffering from paralysis, under which she lingered till December 27, 1730. The new venture opened December 2, 1729, with *Lotario*, followed by *Partenope*. The next season began November 3, 1730, and contained the new opera *Poro*: *Ezio* and *Sosarme* followed. This spring saw several revivals of *Esther*, also two of *Acis and Galatea*. The season of 1732-33 brought forward *Orlando*. The speculation, however, was not successful, the quarrels with the singers and rival composers were continual, and the result was the opening of the 'Opera of the Nobility,' to which the whole company had revolted, in Lincoln's Inn Fields, December 29, 1733. The struggle was tremendous. On one side was Handel with his partner; on the other a company of rich and powerful noblemen, with all the composers that could be got together—Buononcini, Porpora, Hasse, and all the great singers. Handel's season began October 30, 1733, and he brought out *Arianna*. His contract for the King's Theatre expired July 6, 1734; then began a series of disasters and worries. The Nobility took the King's Theatre, and Handel was driven first to Lincoln's Inn, and then to Covent Garden, where, in partnership with Rich, he produced six new operas, *Ariodante*, *Alcina*, *Atalanta*, *Giustino*, *Arminio*, *Berenice*, besides reviving many of his old ones. On June 11, 1737, the Nobility retired, with a loss of £12,000, while Handel's losses had been so severe, including £10,000 of funded savings, that he was

obliged to compound with his creditors, and give bills for a large amount. No wonder that the health of even his massive frame broke down: paralysis disabled his right arm, and his mind was for a time seriously disordered. A visit to Aix-la-Chapelle, and the strongest remedies there, however, restored him, and by November 7 he was back in London. This ended his career as composer-manager.

Handel's opera days were now over. True, he wrote a few more for his old partner Heidegger—*Parnasso*, *Serse*, *Imeneo*, and *Deidamia*—but henceforward he was to tread a nobler path, that of the English oratorio, which has rendered him immortal. *Esther* had been composed before 1720, *Deborah* and *Athalia* in 1733, *Alexander's Feast* in 1736, in the very thick of his opera squabbles. Then came the funeral anthem for his friend Queen Caroline, 'The ways of Zion' (1737), itself almost an oratorio, and containing some of his noblest music. *Saul* was produced early in 1739; *Israel in Egypt* followed in three months; then the *Ode for St Cecilia's Day*, November 1739, and *L. Allegro*, February 1740. The *Messiah*, finished September 14, 1741, was produced in Dublin, April 13, 1742. He returned to London shortly after, and produced *Samson* (which he had begun before leaving for Dublin), as the leading work in an oratorio season of twelve nights, in the course of which the *Messiah* was first given in London. The new style told, and he enjoyed a short time of prosperity. In 1743 he had a return of paralysis, and in 1751 we find him at Cheltenham drinking its waters. But nothing interferes with his activity. From 1744 to 1750 oratorio follows oratorio, like huge rocks thrown forth from a crater. The *Dettingen Te Deum* and an anthem, 'The King shall rejoice,' in commemoration of the great victory, were followed by *Joseph*, *Semele*, *Belshazzar*, *Hercules*, *The Occasional Oratorio*, *Judas Maccabæus*, *Alexander Balus*, *Joshua*, *Solomon*, *Susanna*, and *Theodora*. Of these *Judas*, written as a hymn of triumph on the campaign of Culloden, has always been the most popular.

Handel's music had now taken wider possession than ever of the public, and had penetrated to a lower stratum. At the Lenten 'Oratorios' nothing else was done. There, too, were his great organ performances, which were very popular. He was probably not a great pedalist, but the spirit and fire of his playing must have been immense. He has left eighteen organ concertos to testify to it. He composed for all occasions. The *Anthem for the Peace* and the *Fireworks Music* for the public fêtes after the treaty of Aix-la-Chapelle were both his. The Foundling Hospital acquired much wealth through his music, and he himself made money, so that at his death he had the large sum of £20,000 in the funds. Of this £1000 was left to the Royal Society of Musicians.

In the summer of 1750 he went abroad, and again missed Bach, who died July 28. After his return he wrote *Jephthah*, his last oratorio. His eyes had for some time troubled him, and in May 1752 he was couched, but with no success. Henceforward, with some slight glimmering, he was virtually blind; but with the help of his old pupil, John Christopher Smith, he continued his Lenten oratorio-concerts to the end. His last note was probably a pencil quaver, inserted in a quintet in *Jephthah*. He died in his house (now No. 25) in Brook Street, Bond Street, at 8 A.M., Easter Eve, April 14, 1759, aged seventy-four, and was buried in Poet's Corner, Westminster Abbey, 8 P.M., April 20. At this time Haydn was twenty-seven, and Mozart three.

There is something expressly English in Handel's characteristics. His size, his hearty appetite, his vast productiveness, his domineering temper, his humour, his power of business, are all our own. So was his eye to the main chance. When a friend picked out the best pieces in one of his oratorios, he said, 'True, they are the best; but you have forgotten the pieces that are to make the money.' In fact he pre-eminently belongs to England. The practical sense of his music, and its close alliance with the Bible, joined to its lofty imaginativeness, suit the English public. Its sacred character and its independence of the theatre also fall in with our Puritan spirit. Abroad he is little known, and that mostly as a curiosity. But to the great English public he is even still their meat and drink. And yet on how slender a thread does the connection hang! But for the oratorios of the *Messiah* and *Israel in Egypt* Handel's name could hardly have been what it is to us. His operas scarcely lasted beyond their original production. When *Giulio Cesare* was revived in 1787 (the year in which *Don Giovanni* was brought out in Vienna), it had to be enriched by the most favourite songs from the others, to make it go down. The *Messiah*, however, took the English people from the first, and has gone on being performed more and more till now. It must have been heard oftener than any play of Shakespeare's. The revival of *Israel* followed in our own times, though its fame is still incomplete. It is no exaggeration to say that these two works have made Handel's name immortal. In them he fortunately forgot that the house had to be filled; nothing is *ad captandum*—all is pure music. But for the light reflected from them few of his works would have remained to the present day. The bright light cast from these two masterpieces illumines a number of compositions which otherwise would have forever remained in the dark. More than this, there can be no doubt that the enormous spread of music since his day has been very largely due to the popularity of the *Messiah*. Cheap editions of that noble work have always led the van.

It is unnecessary to describe the characteristics of his compositions, because every Briton knows them, or can know them. His plagiarism must be mentioned, though there is no room to deal with both sides of the subject. His habit of using—almost of preferring—ideas from strangers or from his own earlier works is most remarkable. Perhaps this was his own practical way; the work had to be done in the time, and he trusted in himself that all would be right. Perhaps, too, the habit came from a deeper source than mere economy. When writing the Hallelujah Chorus, he looked up like Isaiah in the Temple, and had the same vision. 'I did see,' said he, 'all heaven open before me, and the Great God Himself.' This was the spirit in which he composed; and to one so near the fount of inspiration themes or passages will always be subordinate to the general result, which in Handel's case is pure gold. Sometimes he takes movements bodily ('Egypt was glad'), but he oftener adopts fragments or subjects. His power of transformation is extraordinary. He will take an ordinary theme from some trivial work, and transmute it into an absolutely immortal monument ('Hailstone chorus'). On the other hand his very greatest works are absolutely his own ('Hallelujah;' 'The people shall hear,' &c.). And the remarkable thing is that with all this business-like procedure the effect is so high, characteristic, and appropriate. Beethoven's judgment on him was perfectly sound: 'Handel is the unapproachable master of all masters; go to him and learn to produce great effects with little means.'

Handel's powers of work were enormous. He rarely sketched his pieces, but began the score

at once. Scoring was a light matter in those days, but even so he was very rapid. *Rinaldo* was written in fourteen days, *Tamerlano* in twenty, the *Messiah* in twenty-four, and *Israel* in fifteen.

His face was far nobler than is usually supposed. The portraits are mostly poor, and the gross features they give are part of the inveterate caricature which pursued his figure, his features, and his language through life. Those who want to see him as he was should have a cast of Roubiliac's head in Westminster Abbey, itself taken from a mould, and full of tenderness and dignity. His smile is said by those who had seen it to have been heavenly, 'like the sun breaking through a cloud.' For English biographies read his Memoirs by Mainwaring (1770), and his Life by Rockstro (1883), with a complete list of works and dates. Chrysander's German biography is invaluable, but unfinished (vols. i.–iii. 1856–67). Of the works themselves the best edition is that of Chrysander (1856 *et seq.*); with all possible condensation they fill ninety-eight vols. The majority of the autograph MSS. are at Buckingham Palace; sketches are at Cambridge in the Fitzwilliam.

The first Handel Commemoration performance was held in Westminster Abbey in 1784; Handel Festivals have been held since 1859, usually triennially, at the Crystal Palace. Handel societies for the publication of Handel's works were founded in London in 1843, and Leipzig in 1856, and a Handel and Haydn Society for performances of their works at Boston, U.S., in 1815.

Handfasting (in Old English, merely 'betrothal;' A.S. *handfæstan*, 'to pledge one's hand') was a custom at one time prevalent in Scotland, by which a man and a woman entered into conjugal relations on the strength simply of a verbal contract of marriage. Persons so handfasted were bound to each other for a twelvemonth and a day, after which they could either separate or be formally united in marriage. The custom had its great evils in society, and the clergy, both of the pre-Reformation and the post-Reformation churches, directed many injunctions against it. See Morganatic Marriage.

Handicapping is the term used in various games and sports to denote the placing of competitors, good, bad, and indifferent, on such a footing that all shall have, as nearly as possible, an equal chance of winning. Thus, in Horse-racing (q.v.), when the speed of one horse has been ascertained to be greatly superior to that of another, the swifter of the two, in a handicap race, is made to carry extra weight to an amount that shall be deemed sufficient to reduce its speed to a level with that of its antagonist. In pigeon-shooting from traps, the more skilful the shooter, the farther back has he to stand from the traps. In games such as chess and draughts, certain 'men' are allowed to the inferior player; in billiards, the better of two allows his antagonist a certain number of 'points;' at cricket, an eleven, such as the eleven of All England, will sometimes play against twenty-two others, the competition being at times very close. In swimming and in pedestrianism, the inferior competitors are allowed a certain 'law,' or start; in yachting, the vessel of greater tonnage is handicapped with lesser ones by allowing them extra time for the performance of the race.

Handsel denotes earnest-money, or part-payment, by way of binding a bargain. In some parts of England 'fasten-penny' is used with the same signification. In Scotland handsel popularly signifies the first of a series of transactions in trade, as, for example, the first sale effected in the day or week, or the first of a series of presents. It is likewise employed to signify a present given, generally to a servant or child, on the first Monday in the year—hence called Handsel Monday.

Hand-tree (*Cheirostemon platanoides*), a large tree of the natural order Sterculiaceæ, which receives its name from the peculiar appearance of its flowers. These have no corolla, but a large 5-lobed, angular, coloured calyx—bright red within—from which project the five stamens, united by their filaments into a column, and separating and curving at the summit, where they bear the anthers, so as to have some resemblance to a hand or claw. It is interesting also as being an object of superstitious veneration to the Mexicans, and as being related to the famous Baobab or Monkey-bread (*Adansonia digitata*) of Senegal, Guinea, and other countries of that region of the west coast of Africa.

Handwriting. See Writing, Evidence, Expert.

Hang-chow (*Hang-chau*), the gate of the imperial canal, capital of the Chinese province of Cheh-chiang, and since the Japanese treaty of Shimonoseki (1895) a treaty port, is at the mouth of the Tsien-tang in the Bay of Hang-chow, 110 miles SW. of Shanghai. It was the capital of the Sung empire of southern China previous to its overthrow by the Mongols, and was a splendid city when visited by Marco Polo early in the 14th century. The city, one of the great commercial, religious, and literary centres of China, has clean, well-paved streets and many magnificent temples, is a principal seat of the silk manufacture, of gold and silver work, and is noted for the beauty of its surroundings. From a remote period, many spots in the environs have been the resort of pilgrims; and here several thousands of candidates assemble every year for the public examinations. It was formerly a naval port. The river is subject to a dangerous bore or eagre. Previous to the Tâiping rebellion, the city had some 2,000,000 inhabitants; but it was then (1861) laid in ruins by the rebels, and now contains a population estimated at from 400,000 to 800,000.

Hanging. See Execution, Strangulation.

Hanging Gardens. The Hanging Gardens of Babylon were anciently reckoned among the wonders of the world. Their construction is variously ascribed to Queen Semiramis and to Nebuchadnezzar. Diodorus and Strabo have given descriptions of them. They are said to have formed a square, with an area of nearly four acres, and rose in terraces, supported on masonry arches, to a height of 75 feet. They were irrigated from a reservoir built at the top, to which water was lifted from the Euphrates by a screw. Fountains and banqueting-rooms were distributed throughout the numerous terraces; groves and avenues of trees, as well as parterres of flowers, diversified the scene; whilst the view of the city and neighbourhood was extensive and magnificent.

Hang-nests (*Icteridæ*), a family of finch-like perching birds peculiar to America, and widely distributed over both continents, though most largely represented in the tropical parts of South America. They are often known as American Orioles, a name received because of their brilliant black and yellow colour, not from any connection with the orioles of the Old World. The family includes many well-known birds, such as bob-o-links, cow-birds, grackles, &c., but the name hang-nest is not literally applicable to all, and most perfectly to such genera as Cassicus and Ostinops from tropical South America. The curious purse-like nests woven by many of these birds are often about two feet in length, and have a hole for entrance near the bottom, at one side. One of the best-known species of hang-nest is the Baltimore Oriole (q.v.). The hang-nests are related to the starlings and Weaver-birds (q.v.) of the eastern hemisphere.

Han-hai, an ancient dried-up sea in central Asia, now represented only by Lake Lob nor (q.v.). See ASIA, Vol. I. p. 486.

Hankow (*Han kau*), a river-port of China, in the province of Hu pei, at the junction of the Han River with the Yang tsze, 600 miles W. of Shanghai. Strictly speaking, Hankow is a suburb of the towns of Wu chang and Han yang, the three together forming one huge city. Vessels of large size can reach Hankow, the river being navigable to the city of Ichang, 420 miles higher up. Since 1862 Hankow has been open to foreign trade. The principal article of export is tea, of which one-fourth to one-third out of a total value of two or three millions of pounds exported annually is sent to London. Other articles of export are silk, oil, vegetable tallow, tobacco, hides, nut-galls, coal, musk, and wax. The chief imports are opium, cotton, piece-goods, woollens, metals, sugar, edible seaweed, sapanwood, 'llama' braid, dyes, matches, kerosene oil, and needles. The annual imports sometimes reach a value of over £6,000,000, the exports of over £5,000,000. Of its large trade with the provinces of the interior no statistics are published. Since 1895 a great cotton mill with 700 looms works twenty-two hours daily, making yarn and cloth from native cotton. In 1889 a decree of the emperor authorised the construction of a railway from Hankow to Peking, 700 miles in length. Before the Tâiping rebellion the three cities had a population of over 5,000,000; it is now about 1,700,000, Hankow having 750,000 of these.

Hanley, a town of modern growth, in Staffordshire, in the district known as the Potteries (q.v.), 18 miles N. of Stafford. It manufactures china, earthenware, and encaustic tiles. In the vicinity are coal and iron mines. Hanley was constituted a municipal borough in 1857, and a parliamentary borough, returning one member, in 1885. Pop. (1851) 25,369; (1871) 39,976; (1881) 48,361; (1891) 54,846; of parliamentary borough (including Burslem, q.v.), 86,845.

Hanna, WILLIAM, the biographer of Chalmers, was born in 1808, the son of a theological professor at Belfast. He was educated at the university of Edinburgh, and was ordained in 1835 to the Lanarkshire parish of East Kilbride. He came out at the Disruption, and became in 1850 colleague to Dr Guthrie in Free St John's Church, Edinburgh. He was made D.D. by Edinburgh in 1864, and resigned his church through ill-health in 1867, but survived until 1882. He edited for some years the *North British Review*, and published many theological books, of which perhaps the best known is *Our Lord's Life on Earth* (1869). Well-known works are his *Memoirs of Dr Chalmers*, his father-in-law (4 vols. 1849–52; a fifth, his correspondence, 1853), and *The Letters of Thomas Erskine of Linlathen* (1877–78).

Hannay, JAMES, critic and novelist, was born at Dumfries, 17th February 1827. A few years of boyhood were spent in the navy, from which he was dismissed at eighteen by a court-martial sentence, afterwards quashed as irregular. He early devoted himself to a busy life of letters, finding a favourite pastime in the study of genealogy, heraldry, the classics, and 18th-century English literature. In 1860–64 he edited the *Edinburgh Courant*, and was afterwards British consul at Barcelona, where he died suddenly, 3d January 1873. Of his novels the best are *Singleton Fontenoy* (1850) and *Eustace Conyers* (1855). His *Lectures on Satire and Satirists* (1854) and *Essays from the Quarterly Review* (1861) show wide knowledge and fine literary sense, often expressed in admirably terse and epigrammatic English. Other works were *Three Hundred Years of a Norman House*—the Gurney family (1866), and *Studies on Thackeray* (1869).

Hannibal, a city of Missouri, on the Mississippi, here crossed by an iron railroad bridge, 111 miles by rail NNW. of St Louis. The centre of an important network of railways, it has an extensive trade in lumber, flour, and cattle, and manufactories of flour, tobacco, lime, and railroad cars. There are coal-mines close by. Hannibal is the seat of a Methodist college. Pop. (1890) 12,857.

Hannibal ('the grace of Baal;' cf. the Hanniel of Scripture) was the son of the great Carthaginian general Hamilcar Barca (q.v.), and was born in 247 B.C. It is said that in his ninth year his father led him to an altar and bade him swear eternal enmity to Rome. From the age of nine to eighteen he was trained in war and diplomacy under Hamilcar in Spain; and from his eighteenth to his twenty-fifth year he was the chief agent in carrying out the plans by which his brother-in-law, Hasdrubal, extended and consolidated the Carthaginian dominion in the Peninsula. On the death of Hasdrubal in 221 B.C., the soldiers with one voice chose Hannibal, then in his twenty-sixth year, as their general. Forthwith he crossed the Tagus, and in two years reduced all Spain up to the Ebro, with the exception of the Greek colony of Saguntum. That town, which claimed the protection of Rome, fell in 218 B.C., and the Second Punic war, or as the Romans justly called it, 'the War of Hannibal,' began. Garrisoning Libya with Spaniards, and Spain with Libyans (a precaution against treachery), Hannibal set out on his march for Rome. In the summer of 218 B.C. he left New Carthage with 90,000 foot, 12,000 horse, and 37 elephants, crossed the Pyrenees, and gained the Rhone, where his passage was barred by a host of Gauls. The general thereupon sent part of his troops two days' journey up-stream, with orders to cross the Rhone and fall on the rear of the barbarians. His orders were executed by Hanno, and the passage of the river was safely effected. He crossed the Alps in fifteen days, in the face of obstacles which would have proved insuperable to almost any other commander. His troops, reared under African and Spanish suns, perished in thousands amid ice and snow. The native tribes threatened the annihilation of his force, and were only dispersed by his matchless courage and address. The beasts of burden fell over precipices or stuck fast and were frozen to death. In places, rocks had to be shattered and roads constructed to enable the men to creep round projecting crags. When he gained the valley of Aosta, Hannibal had but 20,000 foot and 6000 horse to attempt the conquest of a power which had lately shown that she could put an army of 170,000 unrivalled soldiers into the field. After allowing his men to recruit in the villages of the friendly Insubres, he overcame the Taurini, besieging and taking Turin, and forced the Ligurian and Celtic tribes on the Upper Po to serve in his army. At the Ticinus, a stream which enters the Po near Pavia, he encountered the Romans under Scipio. The cavalry of both armies joined battle, Hannibal's Numidian horse proved their superiority, and Scipio fell back beyond the Po. The Carthaginians crossed the river, and the first great battle of the campaign was fought in the plain of the Trebia. Placing Mago in ambush with 2000 men, Hannibal enticed the Romans across the stream. His light troops retired before the legionaries, and as Scipio was pressing on to fancied victory he was taken in flank by the terrible Numidian horse, Mago came down in the rear, and the 40,000 men of the consular army were either cut to pieces or scattered in flight. Wintering in the valley of the Po, in the early spring Hannibal crossed the Apennines and pushed through a region of lakes, flooded by the melting of the snows, to Fæsulæ. The beasts of burden perished in vast numbers amid the morasses; the Gauls, disheartened by

the perils of the journey, had to be driven forward by Mago's horsemen, and the general lost an eye. Quitting Fæsulæ, Hannibal wasted Etruria with fire and sword, and marched towards Rome, leaving behind him two consular armies of 60,000 men. He awaited the consul Flaminius by the Lake Trasimene, where the hills, retiring in a semicircle from the shore, enclose a plain entered by two narrow passes. Concealing the main body of his army amid the hills, he placed his Numidians in ambush at the pass by which the Romans must enter; while he stationed part of his infantry in a conspicuous position near the other defile. The Romans pushed into the valley; the pass in their rear was secured by the Carthaginians who had lain in ambush; Hannibal's men charged from the heights, and the army of Flaminius was annihilated. Six thousand infantry cut their way through the farther pass, but these were overtaken by the horse under Maherbal and forced to yield on the following day.

After recruiting his men in the champaign country of Picenum, where the Numidian horses, we are told, were groomed with old Italian wine, Hannibal marched through Apulia and ravaged Campania, dogged by the dictator Quintus Fabius Maximus, whom he vainly endeavoured to entice into an engagement. He wintered at Gerontium, and in the spring took up a position at Cannæ on the Aufidus. A Roman army of 80,000 men, under the consuls L. Æmilius Paulus and P. Terentius Varro, marched against him. Hannibal flung his troops (he had but 30,000) into a space enclosed on the rear and wings by a loop of the river. He placed his Spanish infantry in the centre, with the African foot on either flank. His Numidian horse, now reduced to 2000 men, he posted on the right wing; while Hasdrubal, with 8000 heavy cavalry, was opposed to the Roman cavalry on the left. The legionaries pressed into the loop, and Hannibal drew back his centre before them. Hasdrubal on the left broke the Roman cavalry, swept round to the left wing of the Romans, drove the second detachment of Roman horse into flight, and then came thundering in the rear of the legionaries. The Libyans, who had by the general's orders fallen back as the Romans pressed after the retiring Spanish infantry, now closed on the enemy's flanks. Packed together so closely that they could not use their weapons, assailed in front, flank, and rear, the legionaries were hewn down through eight hours of carnage till 50,000 lay dead on the field. The battle became a butchery. Nearly 20,000 men were taken prisoners. The consul Paulus, the proconsul Servilius, the master of the horse Minucius, 21 military tribunes, and 60 senators lay amid the slain. On his side Hannibal lost but 5700 men. 'Send me on with the horse, general,' said Maherbal, 'and in five days thou shalt sup in the Capitol.'

But the general was wiser than the fiery captain of the horse. It has been common to censure Hannibal for neglecting to march on Rome after the battle of Cannæ. But his dazzling triumph did not for a moment unsettle his clear judgment. He knew that his forces were unequal to the task of storming a walled city garrisoned by a population of fighting men. An attack which he had made on Spoletium had proved the inadequacy of the small Carthaginian army to carry a strongly fortified town. Had he followed the advice of Maherbal, he would, in all likelihood, have dashed his army to pieces against the walls of Rome. His aim was to destroy the common oppressor by raising the Italian allies against her; and the hope was partly justified by the revolt of Lucania and Bruttium, Samnium and Apulia. The soundness of judgment, the patience and self-control which he evinced in this hour of intoxicating success are hardly less marvellous than the genius by which the success had been won. After the battle of Cannæ the character of the war changes. Hitherto Hannibal had swept everything before him. Rivers and mountains and morasses had been powerless to thwart his progress. Army after army, vastly superior in numbers and composed of the best fighting men the ancient world ever saw, had come against him to be broken, scattered, and destroyed. His career through Italy had been, in the words of Horace, as the rush of the flames through a forest of pines. But after Cannæ the tide turned. His niggardly, short-sighted countrymen denied him the support without which success was impossible. As his veterans were lost to him he had no means of filling their places, while the Romans could put army after army into the field. But through the long years during which he maintained a hopeless struggle in Italy he was never defeated. Nor did one of his veterans desert him; never was there a murmur of disaffection in his camp. It has been well said that his victories over his motley followers were hardly less wonderful than his victories over nature and over Rome.

Hannibal spent the winter of 216–215 B.C. at Capua, where his men are said to have been demoralised by luxurious living. When he again took the field the Romans wisely avoided a pitched battle, though the Carthaginians overran Italy, capturing Locri, Thurii, Metapontum, Tarentum, and other towns. In 211 B.C. he marched on Rome, rode up to the Colline gate, and, it is said, flung his spear over the walls. But the fall of Capua smote the Italian allies with dismay, and ruined his hopes of recruiting his ever-diminishing forces from their ranks. In 210 B.C. he overcame the prætor Fulvius at Herdonea, and in the following year gained two battles in Apulia. Thereafter, he fell upon the consuls Crispinus and Marcellus, both of whom were slain and their forces routed, while he almost annihilated the Roman army which was besieging Locri. In 207 B.C. his brother Hasdrubal marched from Spain to his aid, but was surprised, defeated, and slain at the Metaurus by the consul Nero. By the barbarous commands of Nero, Hasdrubal's head was flung into the camp of Hannibal, who had been till then in ignorance of his brother's doom. The battle of the Metaurus sealed the fate of 'the lion's brood'—of the great house of Hamilcar. But for four years Hannibal stood at bay in the hill-country of Bruttium, defying with his thinned army every general who was sent against him, till in 202 B.C., after an absence of fifteen years, he was recalled to Africa to repel the Roman invasion. In the same year he met Scipio at Zama; his raw levies fled, and in part went over to the enemy; his veterans were cut to pieces where they stood, and Carthage was at the mercy of Rome. So ended the Second Punic war—the war, as Arnold so truly said, of a man with a nation, and the war which is perhaps the most wonderful in all history. Three hundred thousand Italians had fallen, and three hundred towns had been destroyed in the struggle.

Peace being made, Hannibal turned his genius to political toils. He amended the constitution, cut down the power of the ignoble oligarchy, checked corruption, and placed the city's finances on a sounder footing. The enemies whom he made by his reforms denounced him to the Romans, and the Romans demanded that he should be surrendered into their hands. Setting out as a voluntary exile, Hannibal visited Tyre, the mother-city of Carthage, and then betook himself to the court of Antiochus at Ephesus. He was well received by the king, who nevertheless rejected his advice to carry the war with Rome into Italy. On the conclusion of peace, to avoid being given up to the

Romans, he repaired to Prusias, king of Bithynia, for whom he gained a naval victory over the king of Pergamus. The Romans again demanding that he should be surrendered, he baffled his enemies by taking poison, which, we are told, he carried about with him in a ring, and died at Libyssa about the year 183 B.C.

In judging of the character and achievements of Hannibal, it must never be forgotten that for all that we know of him we are indebted to his implacable enemies. No Carthaginian record of that astounding career has come down to us. The Romans did all that unscrupulous malignity can to blacken the fame and belittle the deeds of the most terrible of their foes. Yet, though calumny has done its bitterest against him, Hannibal not only dazzles the imagination but takes captive the heart. He stands out as the incarnation of magnanimity and patriotism and self-sacrificing heroism, no less than of incomparable military genius. Napoleon, the only general who could plausibly challenge the Carthaginian's supremacy, had throughout the greater part of his career an immense superiority to his adversaries in the quality of the forces which he wielded. He had the enthusiasm of the Revolution behind him, and he was unhampered by authorities at home. Hannibal, on the contrary, saw his plans thwarted and finally wrecked by the sordid merchant-nobles of the city he strove so hard to save. He had not, like Alexander, to lead picked troops against effeminate Asiatics. He had to mould his little army out of raw and barbarous levies. He had no reinforcements to fall back on. With a motley army of Libyans, Gauls, and Spaniards he had to encounter a nation in arms a nation of the stoutest and most highly-trained warriors of ancient times. There is not in all history so wonderful an example of what a single man of genius may achieve against the most tremendous odds as the story of the Phœnician hero the greatest captain that the world has seen. See Bosworth Smith's *Carthage and the Carthaginians* (1879); Hennebert's *Histoire d'Annibal* (1870-92); Dodge's *Hannibal* (1891); and works cited at CARTHAGE.

Hannington, JAMES, first Bishop of Eastern Equatorial Africa, born 3d September 1847, at Hurstpierpoint in Sussex, became a student of St Mary Hall, Oxford, in 1868, and was ordained in 1873. In 1882, after seven years' earnest labour in his native parish, he volunteered for missionary work in Africa, and was sent out by the Church Missionary Society to reinforce their missionaries in Uganda. But his health broke down when he reached Kagei, on the south shore of Victoria Nyanza, and he was obliged to return home to England. His health improving, he was, on 24th June 1884, consecrated Bishop of Eastern Equatorial Africa, and in the following January entered his new diocese, taking up his quarters at Frere Town, near Mombasa. In July 1885 he started once again for the interior, the object of his journey being to reach the mission-station of Rubaga, in Uganda. But, after successfully surmounting the difficulties and dangers of the road through the land of the Masai, he was slain by order of Mwanga, king of Uganda, on 29th October 1885, at a place not far from the right bank of the Nile. See his Life by Dawson (1887) and his *Last Journals* (edited in 1888).

Hanno, a name borne by a number of Carthaginian admirals and soldiers, one of whom was defeated by the Romans in the sea-fight of Ecnomus in 256 B.C. Another Hanno, surnamed the Great, was the leader of the peace party who opposed the patriotic party headed by Hamilcar Barca, during the interval between the First and the Second Punic war. When the Carthaginian mercenaries revolted in 241 B.C. Hanno was appointed to reduce them to submission. He proved a thoroughly incapable general, and the task in which he had failed was discharged by Hamilcar Barca.

Hanno, a king or magistrate of Carthage who undertook a celebrated voyage of discovery along the west coast of Africa. His expedition is said to have consisted of sixty ships; he founded numerous colonies or trading-stations, and proceeded as far south as a point that has been variously identified with places between Cape Nun and the Bight of Benin. On his return to Carthage he inscribed an account of his voyage on a tablet, and placed it in the temple of Moloch. It seems to have been written in the Punic language; the version of it which remains, entitled the *Periplus of Hanno*, is only a Greek translation. The date of the voyage has been assigned to different periods between 570 B.C. and 470 B.C., and the identification of the author of it has been also a subject for dispute. For a full discussion consult Dodwell's Dissertations, prefixed to Hudson's *Geog. Vet. Scriptores* (1698); Bougainville's, Vivien de St Martin's, and Tauxier's Essays, Falconer's English translation (1797), and Meu's *Mémoire sur le Périple d'Hannon* (1885).

Ha-noi, the capital of Tong-king, and headquarters of the French administration, on the left bank of the Song-coi or Red River, 80 miles in a direct line from the sea. The commercial city has a river-front of a mile and a half; the citadel behind contains within its walls most of the official buildings. Embroidery and work in mother-of-pearl are the chief local industries. Pop. 100,000.

Hanover (Ger. *Hannover*), formerly a kingdom of northern Germany, but since 1866 incorporated with Prussia. Area of the Prussian province, 14,833 sq. m., or nearly twice the size of Wales; pop. (1871) 1,963,080; (1885) 2,172,702; (1890) 2,278,361, mainly Lutherans, with 280,000 Catholics, and 16,000 Jews. Except in the south, where the Harz Mountains (q.v.) attain a maximum altitude in Hanover of 3037 feet, the surface belongs to the great north German plain, and is diversified by moors and heaths, notably the extensive Lüneburg Heath. It is watered by the Elbe, Weser, Ems, and their tributaries. The people carry on mining in the Harz, cattle-breeding on the marshes and heaths, agriculture in the more fertile regions, and seafaring pursuits on the coast. The weaving of linen, cloth, and cotton, the working of iron and other metals, glass, paper, and pottery making, and bleaching, count amongst the more important industries. The mining products are very various, and include iron, silver, zinc, lead, copper, coal, salt, petroleum, and turf. Bees are kept in the Lüneburg Heath; Norderney and Borkum (islands) are much frequented as seaside resorts. Göttingen is the seat of a university, and the capital is Hanover (q.v.). See also PRUSSIA, GERMANY.

The people of the north-eastern and central provinces are mostly Saxons; those on the coast are of Frisian origin; those on the west of the Ems, Dutch; and those in the southern provinces, Thuringians and Franconians. Platt-Deutsch, or Low German, is commonly spoken in the rural districts; but High German is the language of the educated and higher classes, and is spoken with more purity than in any other part of the empire.

History. Hanover was occupied in remote ages by Saxon tribes, who, after an obstinate resistance, submitted to Charlemagne and embraced Christianity. In the time of Louis the German it was incorporated in the duchy of Saxony. In 951 the Emperor Otho I. bestowed it on Hermann Billing; on the extinction of his family in 1106 it fell to

Lothaire of Supplinburg. By the marriage of his daughter to Henry the Proud of Bavaria, the duchy passed to the Guelphs. Henry the Lion, son of Henry the Proud, did much to advance the civilisation of his subjects by conferring rights and privileges upon various towns which had advocated his cause; but, when he fell under the ban of the empire, a period of anarchy and confusion succeeded, which at first threatened the ruin of the country. When, however, in 1180 Henry was deprived of the duchy of Saxony, he was allowed to retain his hereditary lands of Brunswick and Lüneburg. From this time down to the 16th century the history of Hanover is inseparable from that of Brunswick (q.v.).

The history of Hanover as a modern state begins with the foundation of the line of Brunswick-Lüneburg by William, who, in the partition which he and his elder brother Henry (founder of the Brunswick house, extinct in 1884) made of the dominions of their father, Ernest I., obtained in 1569 the duchies of Lüneburg and Celle (Zell). William died in 1592, leaving seven sons, of whom four successively ruled over the land. Of the seven only one (George) married. His eldest son, Christian Lewis, in accordance with a family compact, took (1648) as his portion of the inheritance Lüneburg, Grubenhagen, Diepholz, and Hoya, with Celle for his residence; while his next brother, George William, obtained Kalenberg and Göttingen, with Hanover for his residence. Thus originated the lines of Celle and Hanover. Christian Lewis set himself the task of raising his country from the miseries it had endured in the Thirty Years' War. After his death in 1665 his brother George William exchanged his own duchy for that of Celle, leaving Hanover to a younger brother, John Frederick. George William, as Duke of Celle, deserves notice for his warlike and active administration: he sent auxiliaries to Venice to aid the republic against the Turks; co-operated with the Duke of Brunswick to reduce his insurgent capital; entered into an alliance with the emperor against France and Sweden; sent an army into Hungary to resist the Turks; and in 1688 lent troops and money to William of Orange against James II. of England. John Frederick of Hanover entertained a great admiration for the French, and aped the magnificence of the court of Versailles. He was succeeded by his brother, Ernest Augustus (another son of George), in 1679. Thus the Hanoverian territories were again united under one head, in George Lewis, son of Ernest Augustus, who succeeded to the duchy of Hanover in 1698, and to that of Celle in 1705. The mother of George Lewis was Sophia, daughter of Frederick V. of the Palatinate and of Elizabeth, daughter of James I. of England. In 1714 George Lewis became king of England as George I. His father, Ernest Augustus, had in 1692 been invested with the dignity of the newly-created ninth electorate.

Under George Lewis as king of England and second elector of Hanover or Brunswick-Lüneburg, a brighter epoch opened to the Hanoverians; they were relieved from the burden of maintaining the ducal court and household, and the revenues of the crown were thenceforth appropriated to the general purposes of the state. The government was left in the hands of a viceroy and the confidential council. Bremen and Verden were obtained in this reign by purchase from Sweden (1719). George II., who succeeded in 1727, like his father spared the revenues of Hanover at the expense of those of England. In his character of elector, he espoused the cause of Maria Theresa in the Austrian war of succession; but in the Seven Years' War Hanover sided with Prussia against Austria and France, and suffered severely, especially by the capitulation of Closter-Seven (1757). This king founded the university of Göttingen in 1734–37. The peace which prevailed during the first thirty years of the reign of George III., who succeeded on the death of his grandfather in 1760, and who alone of the four Georges never visited his German dominions, proved a veritable godsend to Hanover, which also profited by the increased English and American trade. In 1793 Hanoverian troops took part in the wars against the French Republic, the expenses of their maintenance being defrayed by England. But in 1801 Prussia, refusing to acknowledge the neutrality of Hanover, threw troops into the electorate, and maintained her military occupancy for a year. In 1803, when war was renewed between England and France, an army under Mortier intimidated the Hanoverians to such an extent that, without striking a blow, they pledged themselves to abstain from serving against France, to disband their army, to give up their arms and horses to the enemy, and to submit to receive a French corps of occupation 30,000 strong. In 1807 Napoleon appropriated a portion of the electorate to complete the newly-formed kingdom of Westphalia, which in 1810 received the whole of the Hanoverian territory. On the successful termination of the war of liberation, Hanover was created a kingdom in 1815. In 1819 a new constitution was granted, which made provision for the election of two representative chambers; but it only lasted until 1833. Nevertheless, the general disaffection and distrust had risen to the highest pitch when William IV. ascended the throne; and in 1831 the prime-minister, Count Münster, who had long been obnoxious to the mass of the people, was dismissed, and the Duke of Cambridge, son of George III., who had since 1816 acted as governor-general, was invested with the title of viceroy. George IV. was of course also king of Hanover; but on the death of William IV. in 1837 Hanover was separated from England and given to the next male heir, Ernest Augustus, Duke of Cumberland, the fifth son of George III. (1771–1851). This prince initiated a policy in all respects reactionary; but in 1848 he did so far yield to the storm as to just save his throne by the unwilling concession of liberal reforms. A famous incident in the struggle was the protest and expulsion in 1837 of seven Göttingen professors (see GÖTTINGEN). His son, the blind George V. (1819–78), who succeeded in 1851, held very extreme views in regard to the kingly power and the claims of the aristocracy, and for fifteen years he struggled against the will of the people in defence of his absolutist ideas. In 1866 Hanover took part with Austria, and at Langensalza (27th June) the army, after a successful defence, was surrounded and capitulated; Hanover was then occupied by Prussia, and finally annexed. George V. until his death, and since then his son, Ernest Augustus, Duke of Cumberland (b. 1845), still maintaining their claim to the Hanoverian throne, were compelled to live in banishment. The incorporation with Prussia was viewed with anything but general favour; Professor Ewald, for instance, to the day of his death, being a staunch adherent of the exiled house. In 1868 the so-called *Welfenfonds* ('Guelph-fund')—the private property of the king of Hanover—was sequestrated by Prussia, and has subsequently been managed by a commission. Prince Bismarck's enemies were wont to affirm that this fund—called by them *Reptilienfonds* ('Reptile-fund')—was largely used for bribing newspapers to support the government policy.

See *Gemeindelexikon für die Provinz Hannover* (Berl. 1887); and works by J. Meyer (1886), Grotefend (1857), and Meding (1881–84).

Hanover (Ger. *Hannover*), formerly capital of the kingdom, now chief town of the province of

Hanover, is situated on a sub-tributary of the Weser, 78 miles SE. of Bremen, 112 S. of Hamburg, and 158 W. of Berlin. It consists of the old town, with narrow streets and medieval houses, and the handsome modern town, lying north, east, and south-east of the older portion. The most interesting buildings are the town-hall, founded in 1439, with antique sculpture and fine frescoes; the royal library, with 170,000 volumes and 4000 MSS., incunabula, archives, and valuable state papers; the theatre, one of the largest and dramatically one of the most important in Germany; the palace of King Ernest Augustus, with a library and collections of coins, arms, and engravings; the museum, with good natural history and art collections; the royal state palace; the Kestner Museum, with Etruscan, Greek, and Roman antiquities and a collection of engravings (120,000); the polytechnic school, formerly a ducal castle; the castle church, in which are preserved a collection of medieval church utensils, relics, many of them brought from Palestine by Henry the Lion in 1172, and an altar-piece by L. Cranach; the 14th-century 'market' church, with stained glass and monuments; and the 'new town' church, with an elegant tower and the tomb of Leibnitz, who died in Hanover. The magnificent railway station, perhaps the finest in Germany, should also be mentioned. Hanover was the first place in Germany that was lighted with gas (1826). In the immediate vicinity of the town is the royal palace of Herrenhausen, whose beautiful grounds and gardens are open to the public.

Since Hanover became a centre of the North German railway system, its manufactures have greatly increased in importance. Amongst the foremost industries are railway repair shops, iron-founding, typefounding, the manufacture of pianofortes, india-rubber goods, tobacco, linen, sugar, chocolate, hardware, brewing, and distilling. Pop. (1871) 87,641; (1880) 122,843; (1890) 163,153. Hanover is the birthplace of the brothers Schlegel; Iffland the actor and dramatist; Louisa, queen of Prussia; Sir William Herschel; and the historian Pertz. In the 14th century the town was a member of the Hanseatic League, and in the 15th it had a prosperous trade, which, however, declined considerably during the troublous times of the Reformation. From about 1640 its importance rested mainly on the fact that it was the residence of the duke and elector. The revival of its industry within recent years has also brought with it a revival of commerce. See works by Hartmann (1880) and Kalbe (1886).

Hanover, a post village of New Hampshire, pleasantly situated near the east bank of the Connecticut, 55 miles NW. of Concord. It is the seat of Dartmouth College (1770), which is richly endowed, and possesses a library of 65,000 volumes. It includes a medical school and the state college of agriculture and mechanic arts. Pop. 1134.

Hansard, a well-known name in connection with the printing of the British parliamentary records. Luke Hansard, born in 1752 at Norwich, came to London in 1770, and worked for some years as compositor in the office of Hughes, printer to the House of Commons, whom in 1798 he succeeded as sole proprietor of the business. He died in 1828; but his descendants continued to print the parliamentary reports down to the beginning of 1889. In 1837 a bookseller named Stockdale brought an action for libel against the Messrs Hansard, the libel consisting of statements in the parliamentary reports which the latter had printed, and after more than one trial the judges decided in favour of Stockdale. To obviate any similar case an act of parliament was passed, directing that proceedings against persons for publication of papers printed by order of either House of Parliament are to be stayed by the courts of law, upon delivery of a certificate and affidavit that such publication is by order of either House. Cobbett's *Parliamentary History of England from 1066 to 1803* was continued from 1806 by the son and successors of Luke Hansard; and the name Hansard has been since then given to the printed reports of the debates in parliament. But the speeches there printed are not taken down by a special staff of shorthand writers; they are extracted in the gross from the London morning newspapers. They are usually sent to the peers or members by whom they were spoken for revision and correction. See *Biographical Memoir of Luke Hansard* (1829) and Report of Select Committee of House of Commons (1828).

Hanseatic League, or HANSA, a politico-commercial association or league of cities in the north of Germany and the adjoining states, which flourished all through the middle ages. Neither the circumstances out of which it grew, nor the date of its origin, can be precisely determined. The original germs of the union may undoubtedly be recognised in those fortuitous or temporary combinations of merchants, trading along the same routes or in the same places, which were formed for purposes of mutual protection, whether from pirates at sea or from robbers on land, at any-rate from the thousand and one vexations and dangers to which the isolated trader was in those rude times constantly exposed. In course of time more permanent associations were founded abroad, partly for mutual protection, partly for the purpose of securing from the rulers of the state they were domiciled in more favourable conditions for trade, partly in order to control the market and exclude from participation in it all who were not members of their own body.

The earliest guild of German merchants established in a foreign country seems to have been founded in London in or before the 12th century. Certain it is that traders from Cologne were at that time settled there in the enjoyment of special trading privileges. This guild was viewed with favour by the English kings, who from time to time conferred upon its members valuable prerogatives and advantages, in return for services which the wealth and connections of the guild allowed it to render to them. Thus it was with money borrowed from them that Edward III. carried on his campaigns in France. This royally-fostered colony of Easterlings (whence 'sterling,' from the purity of their coined money), as they were called by the English, subsequently, about 1474, developed into the powerful association known as the Merchants of the Steelyard. Other guilds existed later at Boston, Hull, York, &c. Another important centre of the Hanseatic cities in the early years of their confederation was Wisby, on the island of Bornholm in the Baltic. Here, although the guild embraced merchants from several towns, the influence of Lübeck reigned supreme, as that of Cologne did in London. This station was the chief depôt for the trade with Russia, and with the German colony of Livonia, the name given at that period to all the eastern seaboard of the Baltic as far north as the Gulf of Finland. Wisby was also the mother-city of a no less important Hanseatic settlement at Novgorod, near Lake Ilmen, in Russia. At Witten, in the province of Skåne, the southern portion of Sweden, which during the greater part of the middle ages belonged to Denmark; at Bergen, on the west coast of Norway; and at Bruges in Flanders there were Hanseatic depôts of first-rate importance, besides numerous others of secondary consequence scattered along the shores of the North and Baltic seas. Most of these trading-colonies were governed by their own

code of laws and customs, different from those of the country in which they were established. In fact each of them was to all intents and purposes an independent state within a state. As a general rule the members of the colony were not allowed to marry, were put through rough and trying initiation ceremonies, had to work their way up through the various grades of the guild, and after serving a certain number of years had to give place to newcomers from the mother-cities at home; whilst the regulations governing their domestic life, their style of housing, eating and drinking, and amusing themselves, were very similar to those which prevailed in the monasteries of the time.

But there was another and more important phase of the movement—viz. that which developed itself at home. At first the individual cities seem to have acted almost independently of each other in founding trading-colonies abroad; at all events the influence of Cologne was for some time supreme in London, and that of Lübeck supreme in Wisby. But gradually merchants from other commercial towns of Germany were admitted to share the prerogatives of the guild and colony. This spirit of association reacted in turn upon the mother-cities, and about the middle of the 13th century, under the cementing force of a close community of interests, the large trading-cities of north Germany began to co-operate together in leagues, more or less officially constituted. Amongst the earliest of supreme moment was that formed, at the period indicated, between Hamburg and Lübeck (1241) for the protection of the highways connecting the two cities. When, however, Lübeck, which had rapidly acquired a leading position among the commercial towns of north Germany, desired to enter the league of towns which had allied themselves with Cologne, the latter city strove hard to exclude her, but in vain. From this time dates the introduction of a political element into the league. Lübeck soon formed alliances with the Wendish towns on the Baltic, lying to the east—viz. Wismar, Rostock, Stralsund, and Greifswald. The Saxon and Westphalian towns, which had already banded themselves together in separate and independent confederations, joined the principal league, at the head of which Lübeck soon placed herself by common consent of the rest; and the Prussian towns associated themselves about 1340 with those of Westphalia. The cities of the principal league did not, however, form a democratic confederation of municipal states with a regular, well-conceived constitution, such as we find in confederated states at the present day. The first and principal object of the association was to maintain a monopoly of trade, by jealously excluding all rivals, in such countries as Russia, Norway, and the south of Sweden, as well as to preserve in their own hands the special commercial prerogatives which they had managed to acquire in countries like England and Flanders. Thus, in the beginning their interests were mainly concentrated upon their colonies and trading-depôts, and whatever foreign policy they may have had was shaped by the necessities of protecting or furthering those interests, which were of course of a purely commercial character. Yet, as their wealth increased, and therewith their political influence, these Phœnicians of the north began to pursue other than mere ordinary mercantile aims. In Norway, for instance, they insisted that the entire trade of the country, at least of the northern and western portions, should pass through their depôt at Bergen, where they ousted the native Norwegians from their own wharves and warehouses, seized upon their trade, and refused all obedience to the civic authorities of the town. And in Russia their behaviour was not a whit less arbitrary and high-handed. But the first awakening of the league to the consciousness that it was the possessor of real political power came in 1370, when it brought King Waldemar of Denmark, the most powerful and energetic sovereign on the Baltic shores, to his knees, and imposed upon him a humiliating peace. For many, many years relations between the Hanseatic merchants and the Danes had been, and continued to be, those of latent or open hostility, for the Danes were the only serious rivals the Hansa had to encounter, and Denmark had, as now, control of the Sound and the Belts, besides holding possession of the south of Sweden, off whose coasts the great herring fisheries, one of the principal sources of wealth to the Hanse merchants, were in those ages carried on.

From the peace of Stralsund (1370) the Hanseatic League claimed the right of controlling the election of each successive sovereign who was crowned king of Denmark. And by the 16th century its officers had advanced so far in statecraft, and the league itself had acquired so much political influence, that it was able to depose the king of Denmark (Christian II.), and bestow, not only his crown, but also that of Sweden, upon candidates of its own nomination. Yet its power was then already a century on the wane. This result was brought about by the co-operation of a variety of causes, chief amongst which were the following. The discovery of America and of the sea-route to India struck the severest blow at the Hansa by diverting the stream of commerce from the Baltic to the Atlantic shores of Europe. Amongst other changes, it caused a falling-off in the demand for furs, a staple commodity of Novgorod; while towards the middle of the 15th century the herrings ceased to enter the Baltic in such large quantities, but began to direct their course instead to the coasts of Holland. The Dutch members of the league broke away from it early in the 15th century, and by adapting themselves to the altered conditions of the age, soon rose to be formidable rivals of their former associates. The English too were laying the foundations of their subsequent commercial supremacy, and in 1598 Elizabeth deprived the Steelyard merchants of all their privileges, and banished them from the country. The discovery by Sir Richard Chancellor of the sea-route to the White Sea struck a fatal blow at the monopoly hitherto enjoyed by the Hanse merchants in the trade with Russia. The conversion of so many European nations to Protestantism greatly lessened the demand for dried and salted herrings in Lent, as well as for wax for candles, which the Hanse merchants imported in large quantities from Novgorod. In the middle of the 16th century the 'contor' or depôt of Bruges was removed to Antwerp, where, however, the old-fashioned methods of doing business still practised by the Hanse merchants were unable to compete successfully against the more modern and enterprising methods of the Dutch and the Flemings. And unity no longer prevailed within the league itself, for, whilst Lübeck clung with jealous tenacity to the antiquated conservative policy of the past, Hamburg insisted upon conforming itself to the newer conditions of the age; and several of the other towns, finding that the advantages which had formerly accrued to them from their participation in the league were no longer reaped by them, fell off from it one after the other. But the decay must also be attributed in large measure to the advances made by the states of Europe in the knowledge and application of the principles of government; whilst the more perfect preservation of public order, and the removal of many of the vexatious impediments to the free circulation of commerce, deprived

the league of its most efficient *raison d'être*. Finally the Thirty Years War occasioned an entire derangement, and even at times cessation, of all trade relations, a state of things from the evils of which the members of the league never were able to recover. From 1628 onwards the only cities which made any real endeavours to revive the once powerful association were Lübeck, Hamburg, and Bremen. But the resuscitated league, even after its confirmation by the treaty of Vienna in 1815, was more a thing of name than of reality; and in the 19th century Hanseatic cities was not so much the collective title of a combination of towns for trading purposes, as a common name for the independent republican municipal states of Hamburg, Bremen, and Lübeck. In 1870 each of these was made an integral part of the German empire, and by 1889 all had joined the German imperial customs union.

The administration of the affairs of the league was in the hands of deputies representing the constituent towns of the confederation, who met together at least once in every three years, though as a general rule every year, at one of the towns of the league, usually at Lübeck, at which town the archives of the Hansa were always preserved. These assemblies represented the political corporation of the Hanseatic cities; they determined the amount of the duties to be levied on imported and exported goods, fixed the amount of the periodical contributions to be paid by the several towns to the common treasury of the league, decided all questions of peace and war, settled all internal quarrels between the members of the league, and punished disobedient or offending towns by fine, or, in the last instance, by exclusion from the Hansa, called 'unhansing.' As it was always the practice for towns to join the confederation and withdraw from it at their own will, it is not possible to state the precise number of towns which constituted the league. The war against Waldemar of Denmark, which took place when the Hansa was at the summit of its power, was waged by at least seventy-seven cities, though probably the league embraced more than these. See histories of the league by Sartorius (1802–8), Lappenberg (1851), Barthold (1862), and Helen Zimmern (in English, 1889); also the *Hanse Recesse*, or official proceedings of the assemblies (1873 *et seq.*).

Hansi, a town of the district of Hissar, in the province of the Punjab, about 80 miles NW. of Delhi, was a British cantonment from 1802 down to the Mutiny (1857). Pop. 12,656.

Hansom. See CABS.

Hansteen, CHRISTOPH, a Norwegian astronomer, was born at Christiania, 26th September 1784. In 1814 he was appointed to the chair of Mathematics in the university of Christiania, and there, in 1819, published his famous work, *Investigations into Terrestrial Magnetism*, the methods of observation described in which have been generally followed since, and which he himself applied in the course of a journey to the east of Siberia in 1828–30. The scientific results of this journey were published in 1863. In 1821 he discovered the 'law of magnetic force': see MAGNETISM. It was chiefly by his initiative that the astronomical and magnetic observatories at Christiania were founded. He was also professor of Mathematics in the School of Artillery, superintendent of the triangulation of Norway, and reorganiser of the national system of weights and measures. He died at Christiania, 11th April 1873. He published lectures on astronomy, a work on mechanics, another on geometry, several on terrestrial magnetism, and numerous memoirs, of which the greater part are inserted in the *Magazin for Naturvidenskaberne*.

Hanumân is the name of a fabulous monkey, who plays a great role in the legendary history of the second or classical period of Hindu mythology. He is represented there as the strenuous friend and ally of Vishnu, when the latter, in his incarnation as Râma, made his expedition to Ceylon, in order to recover his wife Sîtâ, carried off by the giant Râvana. In the war between Rama and Ravana, Hanumân, on one occasion, is related to have bridged over the ocean between the continent of India and Ceylon with rocks of a prodigious size, which he and his friends threw into the sea. See ENTELLUS MONKEY, VISHNU.

Hanway, JONAS, an eccentric English traveller and philanthropist, born at Portsmouth in 1712. Apprenticed at seventeen to a Lisbon merchant, he afterwards traded at St Petersburg, and in the September of 1743 left that city on an adventurous journey through Russia and Persia, returning in the July of 1750. He published an account of his travels in 1753, and spent the rest of his life mostly in London as one of the commissioners for victualling the navy from 1762 to 1783. He was an unwearying friend to chimney-sweeps, parish infants, and unfortunates, and advocated with earnestness solitary confinement for prisoners, and a milder system of punishment generally. Further, he deserves grateful remembrance for having written down the giving of vails, and as the first Englishman to carry an umbrella at home in spite of the interested insolence of the hackney-coachmen. His attack on tea-drinking was less successful, but here he had the honour to be opposed by Dr Johnson, who for once replied to an attack by answering Hanway's angry answer to his review of his *Essay on Tea*. Elsewhere Johnson said that 'Jonas acquired some reputation by travelling abroad, but lost it all by travelling at home.' He died September 5, 1786. See Pugh's *Remarkable Occurrences in the Life of Jonas Hanway* (1787).

Hanwell Asylum, the lunatic asylum for the county of Middlesex, is situated, not in the parish of Hanwell, but in the adjoining parish of Norwood, 7½ miles W. of Paddington Station, London. It was originally founded in 1831, and now gives shelter to about 1800 patients.

Han-yang. See HANKOW.

Haparanda, a town in the Swedish province of Norrbotten, 1½ mile from the mouth of the river Torneå, and opposite the Finnish town of Torneå (q.v.). It is the commercial outlet for the northernmost province of Sweden, and possesses a meteorological station. Pop. 1150.

Haplodon (lit. 'simple toothed'), a terrestrial rodent peculiar enough to be formed into a family by itself, and regarded as a connecting-link between beavers and squirrels. It is represented by a single species (*H. rufus*), restricted to 'a small area on the west coast of North America, in Washington and Oregon territories, and a portion of California.' The aborigines called it 'Showt'l' or 'Sewellel,' the trappers the 'Boomer' or 'Mountain Beaver.' The animal is plump, with broad head, short limbs, and hardly any tail; measures about a foot in length; and has a brownish colour. It lives socially in colonies, burrows underground, and lives on vegetable matter. As a connecting-link Haplodon is of much interest to naturalists, while the Indians use its skin and probably also its flesh.

Hapsburg, or HABSBURG, HOUSE OF, of which the imperial family of Austria are the representatives, derived its name from the castle of Habsburg, or Habichtsburg (Hawk's Castle), on the Aar, in the Swiss canton of Aargau. The castle was built by Werner, Bishop of Strasburg

(1001–29). The real founder of the family was, however, Albert, who is mentioned in the annals as Count of Hapsburg in 1153. He was appointed landgrave of Upper Alsace, lord of the Zurich hundred, and suzerain of various abbeys by the Emperor Frederick I. Under him and his son, Rudolf I., the family became one of the most powerful in Swabia, including under their rule the territories of the bishops of Constance, Strasburg, Basel, Coire, Lausanne, and those of the abbot of St Gall, with some temporal fiefs. After Rudolf's death in 1232, his sons, Albert IV. and Rudolf II., divided their father's possessions – Rudolf becoming the founder of the Hapsburg-Lauffenburg line. This line again divided into two branches, which became extinct in 1408 and 1415 respectively. Albert IV. laid the foundation of the future greatness of the House of Hapsburg. His eldest son, Rudolf III. (Rudolf I. of Austria), who succeeded him, and who was subsequently (1273) elected emperor, by appropriating the provinces which he had wrested from Ottocar of Bohemia—viz. Upper and Lower Austria, Styria, and Carniola—greatly increased the power of his family. To the family's territories were added in 1336 Carinthia, and in 1364 the Tyrol. On the death of Rudolf IV. (1365) the house divided into the Austrian and Styrian branches; but the former became extinct in 1457, whilst the latter have worn the imperial crown almost uninterruptedly down to the present time (see AUSTRIA, GERMANY, and SPAIN). Meanwhile the original family possessions were gradually absorbed by the Swiss confederated cantons (1386–1474). In 1881 the Austrians proposed to purchase the castle of Hapsburg and give it as a wedding gift to the Crown-prince of Austria; but the people of Aargau refused to hear of the sale.—Compare Prince Lichnowski, *Geschichte des Hauses Habsburg* (1837); also Coxe's *House of Austria* (1807).

Harar, a city of Africa, in the country of the Gallas, about 200 miles WSW. of Berbera, stands on the slopes of the mountains which surround it, Mount Hakim on the west rising to 8400 feet. It is fenced with a low wall and forts, the wall being pierced by five gates. The streets are simply water-channels crossing the uneven surface; the houses are partly stone edifices, partly huts. In the neighbourhood are fine banana groves and coffee gardens. Formerly the place was a commercial centre of considerable importance, but it has now lost a good deal of its trade to Tadjura and Berbera. Coffee, hides, cattle, and a dyestuff called *wars*, are the principal objects of commerce. The population number about 37,000, of whom two-thirds are females. They include native Harari (nearly one-half), Gallas, Somali, and Abyssinians. The Harari, though physically resembling the Abyssinians, differ both in their dress and manners from all their neighbours, but are rapidly becoming assimilated in these respects to the Arabs. Their language would seem to belong to the Hamitic division, and is probably a descendant of the ancient Ge'ez, though Arabic is replacing it for commercial purposes. Harar, which was converted to Islam in 1521, was formerly the capital of an independent state. In 1875 it was conquered by the Egyptians, who gave it back to its native emir; Italian in 1890–97, it is now British. See Burton's *First Footsteps in East Africa* (new ed. 1894).

Harbour, an inlet of the sea, so protected from the winds and waves, whether by natural conformation of the land, or by artificial means, as to form a secure roadstead for ships. It is with harbours which are wholly or in part artificial that this article deals.

Harbours may be divided into harbours of refuge and those for commercial purposes. The latter are often merely tidal—i.e. capable of being entered by vessels only at certain states of the tide, and where the vessels rise and fall with the tide. The former are roadsteads of good depth, protected by breakwaters, and accessible at all times of tide, where ships may take refuge during storms. The two kinds are sometimes combined, there being the harbour proper, and a capacious protected roadstead outside of it, as at Cherbourg and elsewhere.

With the birth of commerce and naval warfare, in the earliest ages of civilisation, arose the necessity for artificial harbours. The Phœnicians, the fathers of navigation, soon set to work to protect their scanty strip of Levantine coast. At Tyre two harbours were formed, to the north and to the south of the peninsula on which the city was placed. At Sidon similar but less extensive works long testified to the wealth and engineering genius of the Phœnicians. The breakwaters were principally constructed of loose rubble.

Carthage, in another part of the Mediterranean, also possessed a harbour, in two divisions, formed by moles, and connected with one another by a canal 70 feet wide. On the inner harbour stood the arsenals, with room around them for 220 warships. Still keeping to the great inland sea, we come to Greece; but here nature had provided so many navigable inlets that little remained to be done by man. Nevertheless, some minor works were executed at the Piræus and elsewhere, chiefly, of course, for warlike purposes. The Romans, finding ships necessary to the dominion of the world, set about constructing harbours for them, in their usual solid and workmanlike manner. The coasts of Italy still show how well they understood both the principles and the practice of this branch of marine engineering. Below is given a plan of the ancient port of Ostia, at the mouth of the Tiber (now more than two miles inland), one of their finest and most complete undertakings of this nature. A distinguishing feature

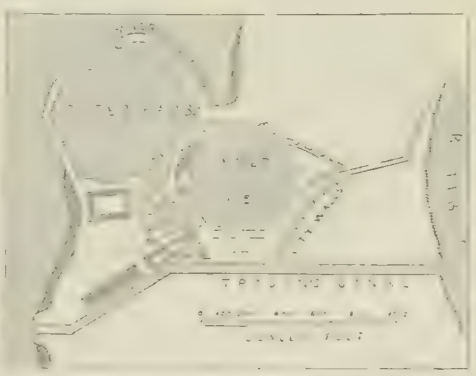


Fig. 1.—Ancient Harbour of Ostia.

of their harbour-making is the open or arched mole. Built with open arches, resting upon stone piers, it gives full play to the tidal and littoral currents, thus preventing the deposit of sand or mud; but in proportion as this advantage is increased (by increasing the span of the arches), so also is the agitation, and consequent insecurity, of the water within. The decay of commerce and civilisation, consequent upon the fall of the Roman empire, put a stop to harbour-making; nor could any want of the art be felt until the revival of commerce by the Italian republics of the middle ages. But the rich traffic of Venice and Genoa soon led to the construction of suitable ports at those places; and

the moles of the latter city and the works in the lagoons of Venice remain to this day. France was next in the field, embanking, protecting, and deepening the mouths of the rivers along her north-western shores, as at Havre, Dieppe, Dunkirk, &c. In 1627, during the siege of Rochelle, Metezeau constructed jetties of loose rubble-stone, to prevent access to the city.

Meanwhile, Britain, whose ocean commerce is of comparatively recent date, lagged far behind her continental rivals. With few exceptions her ports were absolutely unprotected, or rather uncreated; and this state of things continued until late in the 18th century. Two of the few exceptions were Hartlepool, where a harbour was formed about 1250, and Arbroath in 1394. In the 17th century, at Whitby and Scarborough rough piers were thrown out, protecting the mouth of the port; while at Yarmouth a north jetty and subsequently a south one were formed. An ancient mole existed at Lyme Regis, a section of which, from Smiles's *Lives of the Engineers*, is given below (see fig. 3). But the chief efforts of the early English engineers were directed against the shoals and waves of

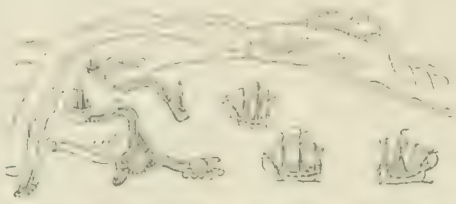


Fig. 2.—Dover Harbour in the time of Henry VIII.

Dover. When, however, Smeaton rose to vindicate the engineering talent of England, things took a different turn; and now few countries surpass Great Britain in the number of artificially improved

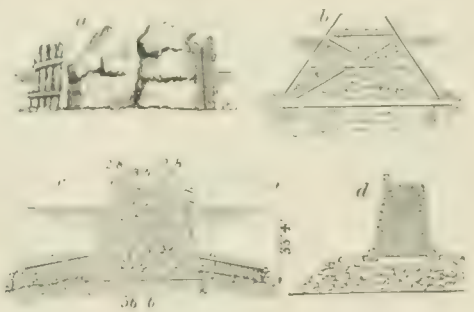


Fig. 3.

a, ancient pier at Lyme Regis; b, wooden framed pier, filled with stones; c, pier at Havre, with apron; d, Hartlepool pier, constructed of masonry.

commercial harbours, or in the just appreciation of their importance.

In the construction of harbours the great desiderata are sufficient depth of water and perfect security for the vessels likely to frequent them, together with the greatest possible facilities for ingress during any weather; while the chief obstacles to be surmounted are the action of the waves upon the protecting piers and breakwaters, and the formation of sandbanks and bars, which diminish the depth of water at the entrance and also within. The designs of harbours, as has been already indicated, may be classified under the following heads: (1) harbours of refuge and anchorage breakwaters; (2) deep-water and tidal harbours for commercial purposes; (3) piers, either straight, or kanted, or curved; (4) quays or wharves.

These different works are obviously suited for different localities, and for contending with different exposures. Quays are clearly suited for the most sheltered situations only, and the engineer must consider, when designing a harbour, which type of harbour will be most economical and effective. In coming to a decision the nature of the traffic, the exposure, and the geological features of the coast must be carefully considered. A good chart or marine survey furnishes valuable evidence as to the force to which harbour-works will be exposed. Among the points to be noted is the *line of maximum exposure*, or the greatest fetch or reach of open sea, as well as the depth of water, in front of the harbour. Thomas Stevenson proved by observations that *the waves increase in the ratio of the square root of their distance from the windward shore* as measured along the line of exposure, and he gives the following simple formula: Where h = height of wave in feet during a strong gale, and d = length of exposure in miles for distances of, say, 10 miles and upwards, then $h = 1.5\sqrt{d}$. The heights so obtained will be increased when they pass into converging channels, and decreased when they pass into expanding channels. The greatest measured height of the waves was by Scoresby in the Atlantic Ocean, where he found billows of 43 feet in height from hollow to crest, and 36 feet was not an uncommon height. At Wick, Caithness-shire, waves of about 40 feet have struck the breakwater. Amongst the greatest recorded forces exerted by the waves may be mentioned the breaking or quarrying out of its position *in situ* of a mass of 13 tons on the Skerries of Whalsay, in Shetland, at a level of 74 feet above the sea—this height, of course, being reached by *sliding*. But the most astonishing feat of which we have any knowledge was at Wick breakwater, where in the winter of 1872 a mass of masonry, concreted together as a monolith, and bound with iron bars 4½ inches in diameter, and weighing no less than 1350 tons, was torn from its seat in the work, and thrown to leeward.

Thomas Stevenson devised an instrument called the Marine Dynamometer for ascertaining *numerically* the force which is exerted by the waves in the Atlantic and German oceans. He found that the mean of his observations during winter was more than three times that exerted during summer, the maximum force recorded being 3½ *tons per square foot*.

Various local causes materially affect the height, and therefore the force of the waves. In some cases, where a strong current runs past the coast, as at Sumburgh *roost* in Shetland, it causes a dangerous breaking sea in the current, and while this *roost* or race continues to rage the coast under lee is comparatively sheltered; but when the force of the tide is exhausted and the *roost* disappears, a heavy sea rolls in upon the shore. It is this encounter between the ground-swell waves of the ocean and the current of tide or land water which causes miniature races at the mouths of rivers.

Another most material element in the question of exposure is the depth of water in front of the harbour; for, if that depth be insufficient to admit of the transmission of the waves, they break or spend themselves before they reach the piers. Thus, Leslie found at Arbroath harbour that the works were not so severely tried by the heaviest waves as by others of lesser size which were not tripped up and broken by the outlying rocks. In the same way, at the river Alne the harbour within the bar is more disturbed by ordinary waves than during great storms. It thus appears that the

largest waves are not always so destructive as smaller ones. Scott Russell has stated the law that waves break whenever they come to water as deep as their own height; so that 10-feet waves should break in 10-feet water, and 20-feet waves in 20-feet water. There seem, however, to be some waves which break on reaching water whose depth is equal to twice their own height. Proofs of the depth to which the surface undulations extend have been given by Sir George Airy, Sir John Coode, Captain Calver, and Mr John Murray, C.E. Rankine has shown that the crest and trough of the sea are not, as was generally believed, equidistant from the level of still water. When l is the length of the wave, H its height from trough to crest,

$$\text{Crest above still water} = \frac{H}{2} + \cdot 7854\frac{H^2}{l}.$$

$$\text{Trough below still water} = \frac{H}{2} - \cdot 7854\frac{H^2}{l}.$$

It has been held by some engineers that in deep water waves are purely oscillatory, having no power of translation, and therefore incapable of exerting any force against a vertical face of masonry. This, however, is incorrect. Were there no wind propelling the waves, no current to interfere with their character, and no interference with one another, such as the reflected wave from a vertical face meeting the next opposing wave, such a theory might be true. True, however, it is not; and all sea-works, in whatever depth of water they may be placed, will assuredly have to withstand impulsive action. Besides, it must be kept in view that in order to reduce the expense of construction it is essential, where the bottom is soft, to make the foundation a pile of loose rubble or concrete blocks. It follows from what has already been said that the rubble, by shoaling the water in front of the work, will cause the waves to become waves of translation before they reach the vertical superstructure, which, assuming the waves to have been simply oscillatory, would have reflected them without breaking, and therefore without their having exerted an impulsive force further than statical pressure upon the masonry.

There is no fixed rule as to the best profile of any sea-work, which must necessarily depend upon a variety of local peculiarities, such as the nature of the bottom, and the size and quality of the materials obtainable. While a long, sloping breakwater does not offer the same amount of resistance to the waves, neither is it in itself so strong, for the weight resting on the face-stones is decreased in proportion to the sine of the angle of the slope. On the other hand, the tendency of the waves to produce horizontal displacement, supposing the direction of the impinging particles to be horizontal, is proportional *to the cube of the sine of the angle of elevation of the wall.*

In tidal harbours, or those in shoal-water, it is admitted by all that the waves break, and therefore exert an impulsive force. Such works have to withstand (1) the direct horizontal force which tends to remove the masonry; (2) the vertical force acting upwards on projecting stones or protuberances, and against the lying beds of the stones; (3) the vertical force acting downwards upon the talus wall, or passing over the parapet and falling upon the roadway; (4) the back-draught, which is apt to remove the soft bottom in front of the work; and (5) the blowing action of waves on the air or water which fills the interstices of open-work piers.

In designing the ground-plan of harbours, some rules should be kept in view: (1) the entrance should be always kept seawards of the works of masonry, care being taken that the direction of the piers does not throw the sea across the entrance; (2) there should be a good 'loose,' or point of departure free of rocks or a lee-shore; (3) spending beaches inside should be provided to allow the waves that pass in to break and spend themselves. A harbour basin surrounded with vertical quay walls becomes a 'boiling pot;' this is a point frequently overlooked by engineers; (4)

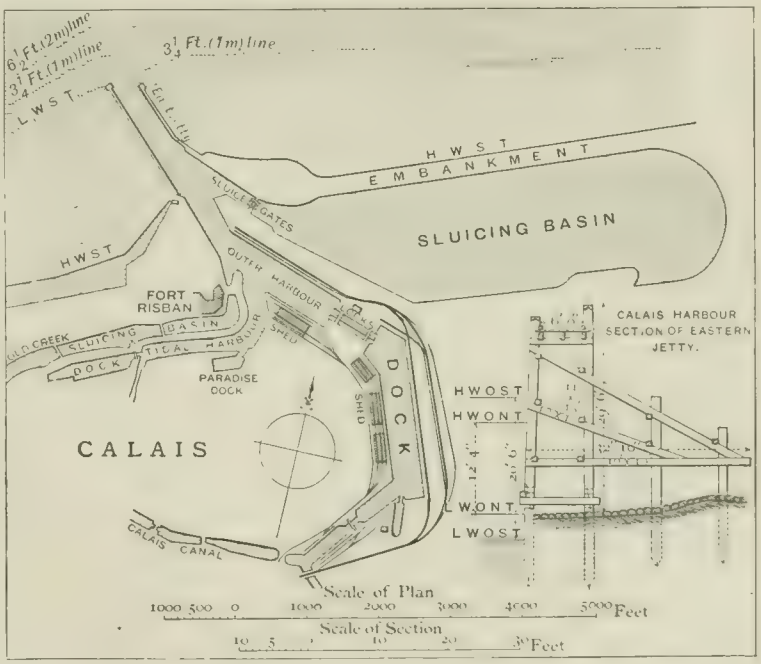


Fig. 4.—Calais Harbour.

the relation of the width of entrance to the area of a harbour should be a matter of careful study, as upon this depends the tranquillity of the interior, or what has been called the reductive power of the harbour. Stevenson's formula for the reductive power is given below: H = height of wave at entrance; b = breadth of entrance; B = breadth of harbour at place of observation; D = distance from mouth of harbour to place of observation; x = reduced height of wave at place of observation.

$$x = \frac{H \sqrt{\frac{b}{B}}}{\left(H + H \sqrt{\frac{b}{B}}\right) \sqrt{D}}.$$

Fig. 4 represents the harbour of Calais, which was constructed by the French government, and opened on 3d June 1889. Great difficulty was

experienced in keeping the entrance free from sand, the old sheeting basin being found quite inadequate for the purpose on account of its distance from the entrance. The large basin constructed has proved more effective, enabling much larger steamers now to be put upon the passage.

Rendel's plan of depositing rubble from open stages of pile-work is frequently used in the construction of deep water piers.

The cross-sectional form of breakwaters depends naturally on the depth of water, exposure, and the materials that can be most easily obtained. The system of bringing up a rubble mound to within 12 or 18 feet of low-water level, and then forming a masonry wall on this base, was adopted at Portland, Alderney, Wick, Holyhead, and other places; while at Dover and Aberdeen the wall with a slight batter has been brought up from the bottom. The introduction of Portland cement concrete in comparatively recent times, as described in the article BREAKWATER Vol. II. p. 415, has greatly facilitated the work of the harbour engineer.

The commercial value of a harbour increases, according to Stevenson, not simply as the depth of the water is increased, but as *the cube of the depth*. Hence the great expense which is willingly incurred for securing even a foot or two of additional depth. The greatest achievement in deepening is at the Tyne, where Ure dredged out the channel to 20 feet at low-water all the way up to Newcastle. In 1889-95 Messrs Stevenson of Edinburgh deepened the lower reaches of the Clyde to 22 feet at low water spring tides. Scouring is also employed for increasing the depth, as by Sir W. Cubitt at Cardiff, where 2500 tons of water a minute are let off. Rendel's scheme for Birkenhead was based simply on the quantity liberated and the sectional area of the channel, and was therefore operative for any distance, and did not depend on the propelling head, or on the direction in which the water left the sluices, which conditions regulate ordinary scouring on the small scale, and which is efficacious for only short distances from the outlet.—Docks (q.v.) of various kinds are connected with harbours.

Pine timber is admirably adapted for soft soils, when the exposure is not great, but, owing to the ravages of the *Teredo navalis* and *Limnoria terebrans* in localities where there is no admixture of fresh water, it is soon destroyed. Greenheart, African oak, and bullet-tree are little affected by the worm, as shown by experiments made in 1814 at the Bell Rock by Robert Stevenson. Even limestone and sandstone are perforated by the Pholades and Saxicavæ. Metals also suffer from chemical action when immersed in salt water. George Rennie's experiments showed that wrought iron resists this action better than cast in the ratio of 8 to 1; while Mallet's experiments show that from $\frac{1}{10}$th to $\frac{4}{10}$ths of an inch in depth of castings 1 inch thick, and about $\frac{6}{10}$ths of wrought iron, will be destroyed in a century in clean salt water. A cannon-ball 4½ inches in diameter became oxidised to the extent of $\frac{3}{4}$ths of an inch in the century.

See BREAKWATER, DOCKS, COALING STATIONS, and the articles on CALAIS, CHERBOURG, DOVER, HAVRE, HOLYHEAD, PLYMOUTH, PORTLAND, &c.; also Sir John Rennie's book on *Harbours*, 4 vols. 1851-54; Thomas Stevenson, *Design and Construction of Harbours*, 3d ed. 1886; L. F. Vernon Harcourt, *Harbours and Docks*, 2 vols. 1885; and the Minutes of Institution of Civil Engineers, *passim*.

Harbour Grace, a port of entry and the second town of Newfoundland, on the west side of Conception Bay, 84 miles by rail WNW. of St John's, has a large but somewhat exposed harbour, with a revolving light, and carries on a considerable trade. It is the seat of a Roman Catholic bishop, and contains a Catholic cathedral and convent. Pop. 7054.

Harburg, a seaport of Prussia, in the province of Lüneburg, is situated 5 miles S. of Hamburg, on the Elbe. Its industries include gutta-percha goods, palm-oil, cotton-seed oil, saltpetre and other chemicals, artificial manure, walking-sticks, leather, mineral water, machines, beer, and jute. Since the deepening of the Elbe the commerce of Harburg has greatly increased. It is a place of holiday resort for the Hamburgers. Pop. (1875) 17,131; (1885) 22,344.

Harcourt, SIR WILLIAM VERNON, the second son of the late Rev. William Vernon Harcourt of Nuneham Park, Oxfordshire, and grandson of a former Archbishop of York, was born October 14, 1827, and educated at Trinity College, Cambridge, where he graduated with high honours in 1851. He was called to the bar in 1854, went the Home Circuit, and was made a Queen's Counsel in 1866. It was during this period that he acquired distinction by his contributions to the *Saturday Review*, and his letters in the *Times* under the signature of 'Historicus.' After unsuccessfully contesting the Kirkcaldy burghs, he was returned to parliament for the city of Oxford as a Liberal in 1868. The following year he was elected professor of International Law in the university of Cambridge. He took an independent tone in the House of Commons, sometimes attacking both friends and foes. But the undoubted mark which he made by his abilities and oratory caused him to be appointed solicitor-general in November 1873, when he received the honour of knighthood. He held office until Mr Gladstone's retirement in February 1874, and when that statesman returned to power in 1880 he was appointed Home Secretary. On seeking re-election at Oxford, however, he was defeated, but was almost immediately returned for Derby upon the opportune retirement of Mr Plimsoll. During the session of 1880 Sir William piloted the Ground Game Bill through the House of Commons, and in 1881 he introduced the Arms Bill (Ireland) in a speech which was strongly resented by the Irish members. He brought in the Prevention of Crimes Bill (1882) and the Explosives Bill of 1883, which dealt summarily with dynamite outrages. He next made an abortive attempt to grapple with the municipality of London. The ministerial policy in the Soudan he defended with much skill on various occasions. In 1885 Sir William went out of office with his chief, but returned with him, as Chancellor of the Exchequer, to power for six months in 1886—an office he resumed in Mr Gladstone's Home Rule cabinet of 1892, and held till 1895. He was elected leader of the Liberal party (out of office) on the resignation of Lord Rosebery in 1896, which office he resigned in December 1898. The letters of 'Historicus' were published in volume form in 1863.

Hardanger Fjord. See NORWAY, p. 529.

Hardenberg. HEINRICH VON. See NOVALIS.

Hardenberg, KARL AUGUST, PRINCE VON, a Prussian statesman, was born at Essenroda, in Hanover, May 31, 1750. After labouring for twelve years (1770-82) in the service of Hanover and eight in the service of Brunswick, Hardenberg chanced to attract the attention of Frederick-William II. of Prussia. On his recommendation he was nominated administrator of the principality of Ansbach and Baireuth, and after the union of this latter to Prussia in 1791 was appointed a Prussian minister of state and a member of the cabinet ministry. In this capacity his chief work was the negotiation of peace between Prussia and the French Republic at Basel in 1795. On the accession of Frederick-William III. in 1797,

Hardenberg was entrusted with the management of important branches of internal affairs, and in 1803 became first Prussian minister. The principal aim of his policy was to preserve neutrality in the war between France and England; but in 1806, when Prussia was coerced by Napoleon into becoming his ally, Hardenberg was dismissed. In 1810, however, he was appointed chancellor of state in succession to Stein (q.v.); and although Prussia was at this period in a deplorable condition, humbled in the very dust before France, Hardenberg addressed himself to the task of completing the internal reforms begun by his predecessor. In the war of liberation he took a prominent part, and saw his efforts crowned by the treaty of Paris, June 1814. Soon after he was raised to the rank of prince. He accompanied the allied sovereigns to London, took part in the proceedings of the congress at Vienna, and in the treaties of Paris (1815). In 1817 he reorganised the council of state, of which he was appointed president. He was also present at the congresses of Aix-la-Chapelle, Carlsbad, Vienna, Laubach, and Verona; and drew up the new Prussian system of imposts. During a tour through the north of Italy he was taken ill at Pavia, and died at Genoa, 26th November 1822. To Hardenberg Prussia is mainly indebted for the improvements in her army system, the abolition of serfdom, of the privileges of the nobles, and of a multitude of trade corporations, the encouragement of municipal institutions, and the reform of her educational system. Yet in his later years he was unable to overcome the reactionary tendencies of the king; all he could do was to moderate them and prevent them running to excess. See Ranke's *Denkwürdigkeiten des Fürsten von Hardenberg* (5 vols. 1877), which includes Hardenberg's own memoirs.

Harderwijk, a fishing-town of the Netherlands, on the south-east shore of the Zuider Zee, 31 miles NE. of Utrecht by rail. From 1648 to 1811 it was the seat of a university. It is now a depôt for recruits for the Dutch East Indian army. Pop. 7339.

Hardhead. See MENHADEN.

Hardicanute, king of England, son of Canute the Great by Emma of Normandy, the widow of Ethelred II. At the time of his father's death (1035) Hardicanute was in Denmark, and the throne of England was given by the witenagemot to Harold, his younger brother; Wessex, however, was reserved for the absent prince, whose claims to the kingdom were upheld by Godwin and Emma. On the death of Harold in 1040 Hardicanute was elected king in his place; but he only reigned two years, dying of apoplexy in 1042. Yet in that short time he provoked the discontent of his subjects by the imposition of a very heavy *danegeld*.

Harding, STEPHEN, the third abbot of the celebrated monastery of Cîteaux, an Englishman by birth, who endeavoured to restore the Benedictine rule to its original simplicity. He died in 1134. See CISTERCIANS.

Hardinge, HENRY HARDINGE, VISCOUNT, British general and governor-general of India, was born at Wrotham, in Kent, 30th March 1785. Gazetted an ensign in 1798, he served all through the Peninsular war, fighting in most of its battles, being wounded at Vimiera and Vittoria, and taking a decisive part in the sanguinary contest at Albuera. From 1809 to 1813 he was also attached to the Portuguese army as a deputy quartermaster-general. On the renewal of hostilities after Napoleon's escape from Elba, Hardinge hastened to join Wellington, who appointed him commissioner at the Prussian headquarters. In consequence of a severe wound received at Ligny he was unable to take part in the battle of Waterloo. From 1820 to 1844 he took an active share in parliamentary life, was Secretary for War under Wellington in 1828, and afterwards Chief Secretary for Ireland. In 1844 he was appointed Governor-General of India. It was during his tenure of office that the first Sikh war broke out. After the peace of Lahore (1845) he was created a viscount, and granted a pension of £5000 by the East India Company, as well as one of £3000 for three lives by parliament. In 1852 he succeeded Wellington as commander-in-chief of the British army. In 1855 he was made field-marshal. In July of the following year he resigned the office of commander-in-chief, and on the 24th of September 1856 died at South Park, near Tunbridge. See the monograph by his son (1891).

Hard Labour. See PRISONS.

Hardouin, JEAN, an eccentric classical scholar, was born in 1646, at Quimper, in Brittany, entered the Jesuit order at the age of twenty, and from 1683 filled the post of librarian of the college of Louis le Grand in Paris. In a spirit of eccentric scepticism, Hardouin maintained that the entire body of classical literature, with the exception of Cicero's writings, Pliny's *Natural History*, Virgil's *Georgics*, Horace's *Satires* and *Epistles*, Homer's *Iliad*, and Herodotus's *History*, was spurious, and had been written by the monks of the 13th century. He also rejected all the reputed remains of ancient art, together with the inscriptions and coins which are attributed to classical times; nay, he even extended his scepticism to the Septuagint version of the Old Testament, and to the Greek text of the New, the original language of which he held to have been Latin! Besides this, he condemned as apocryphal all councils of the Church anterior to the Council of Trent. Yet, with all this extravagance, Hardouin was a scholar of real attainments, and most of his works possess historical and critical value, particularly his edition of Pliny (5 vols. 4to, Paris, 1689). Of his remaining works, the most valuable is the *Collectio Conciliorum* (12 vols. folio, Paris, 1715); a commentary on the New Testament, in folio; and several volumes on numismatics and chronology. He died at Paris, September 3, 1729.

Hardwár (*Haridwára*, 'Vishnu's gate'), perhaps the most famous spot on the Ganges, stands on the right or west bank of the river, at the point where it emerges from the sub-Himalaya into the plains of Hindustan, 39 miles NE. of Saharunpur, North-west Provinces. From its position on the sacred stream, it attracts immense numbers of pilgrims for the purposes of ablution, as many as 100,000 in ordinary seasons (March and April), but every twelfth year a sacred festival brings about 300,000. Hardwár is 1024 feet above the sea, and has a pop. of 4520. See GANGES.

Hardy, ALEXANDRE, a prolific Parisian dramatist (1570?–1630?), from 1600 attached as playwright to the newly-started Théâtre du Marais, for which he wrote from five to seven hundred pieces, of which but forty-one are extant. Of his plays (ed. Stengel, 5 vols. Marburg, 1883–84) the best is *Mariamne*.

Hardy, SIR THOMAS DUFFUS, a distinguished palæographer, was born in 1804, in Jamaica, the son of a major of artillery. His earliest writings—illustrating the reign of King John—appeared in *Archæologia* and the *Excerpta Historica*. In 1861 he succeeded Sir Francis Palgrave as deputy-keeper of the Public Records, in which capacity his learning was equalled only by his courtesy. He was knighted in 1870, and died in London 15th June 1878. His most important works were two folio volumes of the early *Close Rolls* (1833–44), one of the *Patent Rolls* (1835), and others of the *Norman Rolls* (1835) and *Charter Rolls* (1837) for the Record Commission; *Catalogue* of Lord Chancellors,

Keepers of Great Seal, Masters of Rolls, &c. (1843); a *Descriptive Catalogue of MSS.* on British history, 3 vols. 1862–71; and *The Register of Richard de Kellawe*, 1873–78. His brother, SIR WILLIAM HARDY, was born 6th July 1807. On his brother's death in 1878 he succeeded as deputy keeper, was knighted in 1883, and died 17th March 1887. He edited Waurin's *Recueil des Chroniques* (4 vols. 1864–84).

Hardy, SIR THOMAS MASTERTON (1769–1839), born at Portisham, in Dorsetshire, was closely associated in his naval career with Nelson (q.v.).

Hardy, THOMAS, one of the foremost of modern English novelists, a writer of singular power and of marked individuality, was born at Upper Bockhampton, in Dorsetshire, on 2d June 1840. He was trained as an ecclesiastical architect at Dorchester, but spent a great part of his pupilage in reading Latin and Greek with a fellow-student. In London in 1863 he gained the prize and medal of the Institute of British Architects and Sir W. Tite's prize for architectural design; here too he found time to study, at King's College and otherwise, modern languages, literature, and theology. He also began to write: an article, 'How I built myself a House,' appeared in *Chambers's Journal* in 1865, and ranks as his first published production. The experiment of a not unsuccessful novel, *Desperate Remedies* (1871; new ed. 1896), shaped his destiny; and about 1873 he definitely forsook the profession of architecture for that of literature. *Under the Greenwood Tree* (1872), remains one of his most charming stories; and this and *A Pair of Blue Eyes* (1873) prepared the way for his first great work, *Far from the Madding Crowd* (1874), which, first issued in *Cornhill* as a serial, has remained on the whole his most popular book. It was followed by *The Hand of Ethelberta* (1876), *The Return of the Native* (1878), *The Trumpet-major* (1880), *A Laodicean* (1881), *Two on a Tower* (1882), *The Mayor of Casterbridge* (1886), *The Woodlanders* (1887), *Wessex Tales* (collected 1888), *A Group of Noble Dames* (1891), *Tess of the D'Urbervilles* (1891), *Life's Little Ironies* and *A Few Crusted Characters* (collected 1894), *Jude the Obscure* (1895), and *The Well-beloved* (1897). Much of Mr Hardy's earlier work was in poetry, but most of his verses he destroyed; and it was not till 1898 that a volume of *Wessex Poems* appeared. Mr Hardy has contributed largely to periodical literature, and two of his stories have been dramatised. Of his novels, some critics have preferred *The Return of the Native*, others *The Trumpet-major*; but *Tess of the D'Urbervilles* is for most people his most characteristic and, on the whole, his greatest work. It was not for nothing that in youth Mr Hardy, as architect's apprentice in church restoration, visited innumerable villages throughout Wessex; not for nothing did he elect to remain a Wessex man. If there be any tales that are racy of the soil, it is Mr Hardy's stories of Wessex life and manners. Quite exceptional is his command of rustic humour, of the Wessex dialect, and of pithy dialogue. But his chiefest characteristic is perhaps his determination at all risks to present in all its width and depth the tragedy of human life, perhaps to err on the side of regarding life as too terribly and inevitably sad and sombre. Our social system is very imperfect, even rotten; conventions and proprieties are hollow; cant and shams abound; our social code is cruel and cruelly unequal. Passion and the passions are the key of life and of literature, and freedom of speech must be maintained and exercised. Sincerity in art forbids the artist to call a spade anything but a spade, or to invent happy endings for too true stories. Even friendly critics reproach Mr Hardy with pessimism, sometimes to the verge of morbidness. But it may safely be said that if he is pessimist he is not cynical; enough there certainly is of satire and irony. In all his stories unity of plan is consistently kept in view, and incidents all work towards the inevitable conclusion. The nervous English style—appropriate rather than brilliant, natural rather than exquisite—is in just keeping with the austerity of the issues handled and the architectonic completeness of the presentment.

There are monographs on Mr Hardy and his art by Miss Macdonell (1894) and Mr Lionel Johnson (1894)—the latter with a full bibliography of Mr Hardy's publications.

Hardyng, or **Harding,** JOHN, a 15th century English rhyming chronicler, was born in 1378, and was brought up in the household of Harry Percy, the famous Hotspur, whom he saw fall on Shrewsbury field in 1402. Pardoned for his treason, he served under Sir Robert Umfraville, became constable of Warkworth Castle, fought at Agincourt, and served the crown in confidential and critical missions to Scotland. His chronicle, composed in limping stanzas, and treating the history of England from the earliest times down to the flight of Henry VI. into Scotland, he rewrote and presented to Edward IV. just after his accession. It is poor history and poorer poetry, but the account of the Agincourt campaign has the interest of the eye-witness. For his hostility to the Scots he had apparently good grounds in his own experience. Hardyng's *Chronicle* was continued by the printer Richard Grafton down to the thirty-fourth year of the reign of Henry VIII., but Grafton's work was little more than a recast of Hall. The best edition of Hardyng's *Chronicle* and its continuation is that by Sir Henry Ellis (1812).

Hare, a term including all members of the rodent family Leporidæ, with the exception of the rabbit. Its chief distinctive characters are as follows: four incisor teeth in the upper jaw (instead of two as in most Rodentia), two small square teeth standing immediately behind the well-known front teeth; five or six molars in the upper and five in the lower jaw, which are composed of two flat plates disposed transversely; lips thick, with a deep median incision and very mobile, with long bristles; eyes large; ears more or less long; head and body long and compressed; hind-legs long (except in Lagomys), five toes on the fore, four on the hind legs; tail short. The body is covered by a thick, almost woolly coat, which is in some demand for making hats. Two recent genera only are included, Lepus and Lagomys. The Common Hare (*Lepus timidus*) is about 27 inches in

The Common Hare (*Lepus timidus*).

length—of which only 3 inches belong to the tail—1 foot high, and weighs 13–20 lb. The fur consists of two kinds of hairs, one short, thick, and

woolly, the other longer and stouter. The colour, owing to the varying tints of these two sets of hairs, is a dull reddish-brown, paler on the sides and white below, which from its resemblance to the earth is admirably adapted to conceal the animal.

The hare is in the main of nocturnal habits, and passes the day sleeping in its 'form,' a slight depression among the grass and other herbage, sheltered from the sun in summer and the wind in winter. In the evening it creeps out to feed, nearly all vegetable substances being palatable to it; green vegetables and root-crops are, however, its special delicacies, though it will gnaw the bark off trees when hard pressed. In places where it is protected by game-laws it does great damage on account of its voracity and fertility.

In addition to its protective colouring, caution and speed are the hare's security. Crouched in its form, on any sign of danger it at once sits up on its haunches and looks around; its next action is to crouch down and try to conceal itself; should this fail and the enemy approach too near, it betakes itself to flight, in which its long hind-legs give it a great advantage in running either on a level or uphill; in descending it proceeds diagonally, otherwise its springs would overturn it. Its course is chosen with great cunning so as to place all possible obstacles in the way of its pursuer, and though it does not take naturally to water it has been known to swim a considerable distance when closely pressed. It has many enemies; nearly all beasts and birds of prey will attack it, not to mention man, whose pursuit is treated in special articles (see COURSING; also GAME LAWS).

The time of pairing is in February or March, and at this period the pugnacity, which is even more a characteristic of this cautious animal than its proverbial timidity, comes into evidence, for the males fight ferociously for the females. The period of gestation is thirty days; there are three to five young (known as 'leverets') in each litter, and four (rarely five) litters are produced yearly; the first in March, the last in August. The young can see when born, and are only indifferently tended by their mother for about a month.

The Common Hare is distributed over the greater part of Europe and a small portion of western Asia, as far north as Scotland, south Sweden, and Persia, and as far south as France and north Italy. Three different local varieties have been recognised: (1) the South European (*L. mediterraneus*, *L. meridionalis*), small, short, with looser hair of a reddish tinge; (2) the Mid-European (*L. timidus* s. str., *L. campicola*), stouter, with longer hair and brownish-gray; (3) the Eastern form (*L. caspicus*), very thick-haired, and gray or whitish-gray in colour.—The Irish Hare, formerly known as *L. hibernicus*, is not regarded as a distinct species by the best authorities, but as a variety of the Alpine hare.

The Alpine Hare (*L. variabilis*) is distinguished by its smaller size, the shortness of the ears, which are not so long as the head, the white tail about half the length of the head, and the form of the first upper molar. It occurs in the circumpolar regions as far south as 55° N. lat., and also in elevated positions in more temperate regions, such as the Alps, Pyrenees, and probably the Caucasus. As a British form it is confined to the north of Scotland and Cumberland. Three different varieties have been described: (1) the Polar, white both in summer and winter, with the exception of the tips of the ears; (2) alpine form or 'Blue Hare,' grayish-brown in summer; (3) temperate form, grayish-brown both summer and winter, but somewhat whitish in the latter season. The Irish hare is probably this form.

Two species of hare have been recorded from India and central Asia, and one from the Cape. The American continent yields some dozen different forms, only one of which, however, occurs in the southern portion. Among these are the Polar Hare (*L. glacialis*), the Northern Hare (*L. americanus*), and *L. aquaticus* and *L. palustris*, the Swamp and Marsh Hares; these last are excellent swimmers and divers.

Fossil hares have been found in the Pliocene formations of France, the Post-Pliocene of North America, and the caves of Brazil.

The Pikas belong to the genus Lagomys (sometimes made the type of a distinct family, Lagomyidæ), which is distinguished from Lepus by its short hind-legs, very short tail, and rounded ears, as well as by the presence of complete collar-bones.

The type species *L. alpinus* somewhat resembles a Guinea-pig in shape and size; the colour is reddish-yellow sprinkled with black above, redder on the sides and front of the neck, paler below. It continually emits a penetrating whistle, repeated two or three times in succession, which has been compared to the note of a woodpecker. It inhabits burrows in the ground which it excavates for itself, and in which it stores up food for the winter. Its habits are nocturnal. There are eleven different species, which extend from Kamchatka along the chain of mountains in the centre of Asia, just entering Europe in the neighbourhood of the Volga. In America they are confined to certain parts of the Rocky Mountains. See FURS; and *The Hare*, by Macpherson, Lascelles, &c. ('Fur and Feather' series, 1896).

Hare, JULIUS CHARLES, one of the chief early leaders of the Broad Church party, was born near Vicenza, in Italy, September 13, 1795. He spent part of his boyhood in Germany, and after his return was sent to the Charterhouse, from which in 1812 he passed to Trinity College, Cambridge. Here he was elected to a fellowship in 1818, and afterwards became classical lecturer. He tried the study of law, but soon abandoned it, took orders in 1826, and succeeded his uncle in the rich family living of Hurstmonceaux, Sussex, in 1832. He gathered round him a fine library of 12,000 volumes, and numbered among his friends Landor, Maurice, Bunsen, and others of the greatest spiritual teachers of his time. He had John Sterling as his curate (1834–35), and married in 1844 Esther Maurice, sister of Frederick Maurice. He became Archdeacon of Lewes in 1840, in 1853 chaplain to the Queen, and died January 23, 1855. His annual charges are among the most important sources for a study of the ecclesiastical controversies of his time. Another great service that he did was to awaken Englishmen to the fact that they had much to learn in theology from Germany. His style is cumbrous, and his books gain nothing from their orthographical peculiarities. Already in 1820 he had translated Fouqué's *Sintram*, when in 1827 he published anonymously *Guesses at Truth*, written in conjunction with his brother Augustus. His next work was the translation of Niebuhr's *History of Rome* (1828–32) in collaboration with Thirlwall, and his own *Vindication of Niebuhr's History* (1829). His most important contributions to theology are *The Victory of Faith* (1840) and *The Mission of the Comforter* (1846), two series of elaborate sermons preached at Cambridge. In 1848 he edited the *Remains of John Sterling*, with a life, a strong sense of the inadequacy of which inspired Carlyle's masterpiece. Other books are *Parish Sermons* (2 vols. 1841–49) and a *Vindication of Luther against his Recent English Assailants* (1854). See his nephew's *Memorials of a Quiet Life*.—His elder but less important brother, AUGUSTUS WILLIAM HARE, was born in 1792,

and educated at Winchester and New College, Oxford, where he became a Fellow in due course. He was appointed in 1829 to the retired living of Alton Barnes, in Wiltshire, married in 1829 the gifted Maria Leycester (1798–1870), and died prematurely at Rome in 1834. Besides his share in the *Guesses at Truth*, he left fifty-six sermons to be published in two volumes in 1837. Augustus John Cuthbert Hare, nephew of the two preceding, was born at Rome in 1834, and was educated at Harrow and at University College, Oxford. He has written a series of good descriptive books revealing fine artistic taste and wide knowledge of history and antiquities. Amongst these are *Walks in Rome* (1871), *Wanderings in Spain* (1873), *Days near Rome* (1875), *Cities of Northern and Central Italy* (1876), *Walks in London* (1878; new ed. 1894), *Cities of Southern Italy and Sicily* (1883), *Holland and Scandinavia* (1885), *Studies in Russia* (1885), *Paris* and *Days near Paris* (1887), *South Eastern France* and *South Western France* (1890), *Sussex* (1894), &c. Other works are his delightful biography of Maria Hare, *Memorials of a Quiet Life* (1872–76); the *Life and Letters of Baroness Bunsen* (1879), *Two Noble Lives* (1893), and *The Gurneys of Earlham* (1895). See his autobiography (1896).

Hare, Robert, scientist, was born in Philadelphia, 17th January 1781, and filled the chair of Chemistry in the University of Pennsylvania there from 1818 to 1847. He died 15th May 1858. In 1801 Hare described his discovery of the oxy-hydrogen blowpipe (see Blowpipe). In 1816 he invented the galvanic calorimotor. He also devised improved forms of the voltaic pile. In his later years he lectured on spiritualism and published *Spiritualism scientifically demonstrated* (New York, 1855).

Hare and Hounds. See Athletic Sports.

Harebell, or Bluebell (*Campanula rotundifolia*), the most common of the British species of Bellflower (see Campanulas), growing in dry and hilly pastures, on waysides, &c., is found in most parts of Europe. It is a perennial plant, with a slender stem 6 to 14 inches high, bearing a loose raceme of a few drooping flowers, on very slender stalks; the flowers, generally bright blue, but sometimes white, bell-shaped, and about half an inch long, appear in summer and autumn. The juice of the flowers yields a fine blue colour, and may be used as ink.

Harebell (*Campanula rotundifolia*): *a*, lower stem-leaves.

Hareld (*Harelda*), a genus of the duck family (Anatidæ, see Duck), having a short thick bill, and two feathers of the middle of the tail, in the males, greatly elongated. Two species are known; the best known, the Long-tailed Duck or Hareld (*H. glacialis*), inhabits the arctic regions both of the Old and New Worlds, its winter migrations in America extending as far south as the Carolinas.

Harelip is the name applied (from its resemblance to the lip of the hare) to a congenital notch or cleft in the upper human lip, due to imperfect union at an early stage of development of the processes whose formation and fusion separate the mouth from the cavity of the nose. The cleft is not in the middle line, however, as in the hare; but a little to one side (*single* harelip), or there are two clefts, one on each side (*double* harelip). This deformity, especially when double, is often associated with a similar defect in the roof of the mouth (cleft palate). The cause of these arrests of development is quite unknown. Harelip is not at all dangerous, but very unsightly. It can be remedied by a surgical operation, which most surgeons prefer to perform during infancy.

Harem (Arab. *El-Harim*, 'the inviolable') is that part of a polygamist's house which is set apart for the use of his wives and their attendants; it also denotes this collective body of women. In all Mohammedan countries it is customary for wealthy men to keep a harem; for, though four is the number of wives to which the faithful are restricted by the Koran, there is no limit to the number of concubines a man may have except his ability to maintain them. The mention of a harem naturally suggests to most people the female portion of the royal households of Turkey and Persia and Egypt. In the sultan's harem each wife—he alone may have seven—has a separate suite of apartments and a separate troop of female slaves to wait upon her and do her bidding. All the female slaves or odalisques throughout the harem are, however, at the disposal of their royal master. She who first gives birth to an heir, whether wife or slave, is instantly promoted to the rank of chief wife. The title sultana is borne, not by the sultan's wives, but by his mother, sisters, and daughters. The real ruler of the harem is the sultan's mother, but under her is the lady-superintendent of the harem, usually an old and trusted favourite of the sultan. The duties of guarding the harem or seraglio (Ital. from Latin *sera*, 'a bar;' cf. Turkish and Persian *serai* or *saray*), as it is sometimes called, are entrusted to a small army of eunuchs, the chief officer of whom generally enjoys considerable political influence. The inmates of the harem lead a very secluded life. They are not allowed to be seen by men, except their nearest relatives, as father and brother. Their principal occupations are needlework, spinning, and embroidery, which are relieved by the 'cult' of the toilette, and such amusements as dancing, singing, and games. On the death of the sultan those women who have borne daughters to him are at liberty to leave the harem and marry again; the mothers of princes are transferred to the 'old seraglio,' and kept there until they die. In the harems of the great men of Turkey and Egypt a good deal of modern European luxury has been introduced of late years, and the ladies now dress themselves in accordance with fashions derived from Paris or London.

The institution is not, however, confined to Mohammedan countries, but flourishes also, or did flourish, in some form or other, amongst the Jews, Babylonians, ancient Persians, Siamese, &c. In Bangkok, the capital of Siam, the harem of the king forms a walled city within the larger city, so extensive is it.

The holy cities of Mecca and Medina are together called the harems or the sacred places, and the sacred mosque at Mecca is designated the *mesjid el-harim* or 'the inviolable mosque.'

During the 18th and 19th centuries the interiors of oriental harems have been entered and the lives of their inmates studied by several European and American ladies, as those of Constantinople by Lady Mary Wortley Montagu in 1716; those of

Cairo and Damascus by Harriet Martineau in 1847; that of the Khedive at Cairo by two ladies of Mr W. H. Seward's American party in 1871; some in Turkey by another American lady, Mrs Caroline Paine; and the royal harem at Bangkok by yet another lady from the United States, Mrs Leonowens. For harems in India, see ZENANA.

Hare's-ear (*Bupleurum*), a genus of plants of the order Umbelliferæ, having compound umbels of yellow flowers, and generally simple leaves. The leaves of the most common British species, *B. rotundifolium*, are perfoliate. This plant, which grows in cornfields in the chalk districts, is the *Thorough-wax* of the old herbalists. The species of hare's-ear are numerous, and are natives of temperate climates in most parts of the world.

Harfleur (called in the middle ages *Hareflot*), a town in the French department of Seine-Inférieure, is situated on the estuary of the Seine, 4 miles E. of Havre. Formerly Harfleur was an important seaport and maritime fortress, but the rise of Havre, coupled with the sanding up of its harbour, led to its decay. Pop. 2317. It was taken after a six weeks' siege by the English under Henry V. in 1415, and during the next twenty-five years changed hands three times. It was pillaged by the Huguenots in 1562.

Hargraves, EDMUND HAMMOND, the discoverer of the goldfields of Australia, was born at Gosport, in England, in 1815. When eighteen years of age he settled in Australia. Attracted to California in 1849, he there tried his luck as a gold-digger, and whilst so engaged was greatly struck by the similarity in the geological formation of California and Australia, and suspected that gold would be found in the latter. On his return home he proved the correctness of his surmise by discovering gold on the western slopes of the Blue Hills in New South Wales in 1851. He was appointed commissioner of crown-lands, and received from the government of New South Wales a reward of £10,000. In 1855, one year after his return to England, he published *Australia and its Goldfields*. He died in October 1891.

Hargreaves, JAMES, the inventor of the spinning-jenny, used in the manufacture of cotton, was an illiterate weaver and carpenter of Standhill, near Blackburn, in Lancashire, where he was born. In 1760 he helped Robert Peel (the founder of that family) in the construction of a carding-machine; and half-a-dozen years later he invented the spinning-jenny, the idea of which is said to have been suggested to him by seeing a spinning-wheel, which one of his children had upset, continue to revolve horizontally, whilst the spindle revolved vertically. But his fellow-spinners, imbued with strong prejudices against machinery, broke into his house and destroyed his frame. He then removed to Nottingham (1767), where he erected a spinning-mill. Three years later he took out a patent for his invention; but, as it was proved that he had sold some of his machines before the patent was obtained, it was thereby declared to have been invalidated. Hargreaves continued to carry on business as a yarn manufacturer till his death on 22d April 1778, when his share in the mill was bought by his partner for £400. See Francis Espinasse's *Lancashire Worthies* (1874).

Haricot. See BEAN.

Hari-kari (rather *hara-kiri*, 'belly-cut,' also called 'happy despatch'), a term applied to the curious Japanese system of official suicide, obsolete since 1868 (see JAPAN). The Japanese estimated the number of such suicides at 500 per annum. All military men, and persons holding civil offices under the government, were held bound, when they had committed an offence, to disembowel themselves. This they performed in a solemn and dignified manner, in presence of officials and other witnesses, by one or two gashes with a short sharp sword or dagger 9½ inches long. Personal honour having been saved by the self-inflicted wound, the execution was completed by a superior executioner (or rather the victim's second, often a kinsman or friend of gentleman's rank), who gave the *coup de grâce* by beheading the victim with one swinging blow from a long sword. Japanese gentlemen were trained to regard the hara-kiri as an honourable expiation of crime or blotting out of disgrace. See articles by an eye-witness in *Cornhill* (1869).

Häring, GEORG WILHELM HEINRICH, better known under the name of WILIBALD ALEXIS, a German novelist, was born at Breslau, 23d June 1797. He at first studied law at Berlin and Breslau, but abandoned this pursuit for a literary career. His first success as a writer was the historical romance *Walladmor* (1823–24), published as a work by Sir Walter Scott, a fraud that found belief and led to the book being translated into several languages (into English, very freely, by De Quincey, 1824). This was followed by *Die Geächteten* (1825) and *Schloss Avalon* (1827). Häring's subsequent historical romances, the clever character-drawing, historical verisimilitude, and vigorous description of which entitle them to a high rank, are *Cabanis* (6 vols. 1832), *Roland von Berlin* (3 vols. 1840), *Der falsche Woldemar* (3 vols. 1842), *Hans Jürgen und Hans Jochem* (2 vols. 1846), *Der Werwolf* (3 vols. 1848), *Ruhe ist die erste Bürgerpflicht* (5 vols. 1854), *Isegrimm* (3 vols. 1854), and *Dorothe* (3 vols. 1856). Besides these, he wrote books of travel, sketches, dramas, and other works. His *Gesammelte Werke* were published at Berlin in 20 vols. in 1874, the historical romances as *Vaterländische Romane* in 8 vols. in 1884. He died 16th December 1871.

Harington. See HARRINGTON.

Hariri. ABU MOHAMMED AL KASIM IBN ALI, surnamed AL-HARIRI ('the Silk-merchant'), an Arabic writer, was born at Basra, on the Tigris, in 446 A.H. (1054 A.D.), spent his life in study and devotion to literary work, and died at Basra about 1121. He wrote valuable works on Arabic grammar, as *Molhat el Irab*, a work on syntax, and *Durrat el-Ghawwas*, on common faults in current language. But the most famous of his writings, indeed one of the most famous compositions of all times and countries, is his *Makamat* (Literary Gatherings). This is a collection of rhymed tales, the central character in which is a certain Abu Seid from Seruj, a witty, clever, amiable rogue, well read in sacred and profane lore, but cunning and unscrupulous, who turns up under all possible disguises and in all possible places. The brilliancy of imagination and wit displayed in these adventures, their striking changes, and dramatic situations, have hardly ever been equalled; but more wonderful still is the poet's power of language. The whole force of the proverbial fullness of expression, spirit, elegance, and grandeur of the Arabic idiom has been brought to bear on the subject. Indeed, as far as language is concerned, the *Makamat* is looked upon in the East as the highest source of authority next to the Koran. The book has been translated, either entirely or partially, into nearly every Eastern and European tongue, and has been the prototype of innumerable imitations, the most successful being one in Hebrew, *Machberoth Ithiel*, by Yehudah ben Shelomoh al-Kharizi. The best edition of the *Makamat* is that by Silvestre de Sacy, which appeared in Paris, 1822 (re-edited 1847–53). Of translations, the palm is due to Rückert, who

has completely reproduced the spirit and form of the work in his *Verwandlungen des Abu Seid von Serug*, first published in 1826. English translations (partial) have been made by Preston (1850) and by Chenery (1867).

Hari-Rud, or HERI RUD, a river of Asia, which rises in the Hindu Kush about 150 miles W. from Kabul, pursues a western course through Afghanistan for nearly 250 miles; then, bending suddenly to the northward, it forms the boundary between Persia and Turkestan, and, after a further course of about 250 miles, loses itself in several arms in the Tekke Turkoman oasis.

Harivansa, a Sanskrit epos, which professes to be part of the Mahabharata, but may be more properly classed with the Puranas (q.v.).

Harlamoff, ALEXIS, a Russian artist, born at Saratoff in 1844, studied at St Petersburg Academy of Fine Arts, gained several medals, became a member of the Academy in 1869, and soon afterwards settled in Paris. A regular contributor to the Salon, his portraits and pictures of children and young girls, executed with feeling and painstaking care, have rendered him famous. See R. Walker's article in *Good Words* (1889).

Harlaw, 18 miles NW. of Aberdeen, the site of a battle fought on 24th July 1411, between the Highlanders led by Donald, Lord of the Isles, and the Lowlanders of Mar, Garioch, Buchan, Angus, and Mearns, under Alexander Stewart, Earl of Mar. The battle was long and bloody, but the Highlanders were at last driven back, leaving more than 900 dead upon the field. For long after 'the red Harlaw' was a favourite theme of legend and song.

Harlech, an ancient town of Merionethshire, North Wales, stands on the coast, 10 miles N. of Barmouth. On a steep hill overlooking the sea is its massive castle, which held out for the Lancastrians in the Wars of the Roses, and later for Charles I. The 'March of the Men of Harlech' commemorates its capture by the Yorkists in 1468. For the Harlech series, see CAMBRIAN SYSTEM.

Harlequin. See PANTOMIME. The etymology of the word is curious. The Fr. is *arlequin*, from which apparently is derived the Ital. *arlecchino*. The Old Fr. phrase was *le maisnie hierlekin* (Low Lat. *harlequini familiares*), 'a troop of demons that haunted lonely places.' This Skeat derives from Old Fries. *helle cyn*, Icel. *helgar kyn*, i.e. the kindred of hell, host of hell, troop of demons. The change from *hellequin* to *harlequin* was due to a mistaken analogy with *Charles Quint*. See MAX MÜLLER'S *Lectures*, ii. p. 581.

Harlequin Duck (*Anas* [or *Clangula*] *histrionica*), a species of Garrot which receives its name from its variegated markings, white, gray, black, and brown. It inhabits the seashore and its inlets and river mouths, being seldom seen inland. It is found in Kamchatka and Greenland, on the shores of the Caspian Sea, Sea of Aral, and Lake Baikal. In America it is found in Labrador, Hudson Bay, Newfoundland, and Bay of Fundy, and advances in winter southwards to the United States. Its whole length is about 17 inches. See WILD-DUCK.

Harless, GOTTLOB CHRISTOPH ADOLF VON, a German Lutheran theologian, was born at Nuremberg in 1806, and was professor of Theology at Erlangen from 1836, and at Leipzig from 1845. In 1850 he became chief court preacher at Dresden, and exercised great influence on ecclesiastical affairs in Saxony. In 1852 he was appointed president of the Protestant consistory at Munich, and succeeded in making the Lutheran Church in Bavaria strongly orthodox. He died 5th September 1879. His most important works were his *Theologische Encyklopadie und Methodologie* (1837) and *Die christliche Ethik* (1842; Eng. trans. 1868). His autobiography appeared as *Bruchstücke aus dem Leben eines Sudddeutschen Theologen* (1873-75).

Harley, ROBERT, EARL OF OXFORD AND MORTIMER, the son of Sir Edward Harley, an active partisan of the Parliament during the civil wars, was born in London, 5th December 1661. The politics of the family were Whig, and as such Robert Harley entered parliament for the Cornish borough of Tregony. But at the end of his first parliament he was elected for New Radnor, and this constituency he continued to represent until 1711. He soon acquired a great reputation for his knowledge of parliamentary law and practice, and in the parliament which met under the chieftainship of Rochester and Godolphin, in February 1701, he was elected speaker. This post he retained until 1705, though in April 1704 he became also Secretary of State. But shortly after this time Harley began to influence the queen's mind against the party of Marlborough and Godolphin; for, apparently from motives of personal ambition, he now began to intrigue with and for the Tories, and he found a most useful ally in his cousin, Abigail Hill (Mrs Masham). Godolphin failed not to detect what was going forward, and in February 1708 the conviction of Harley's secretary for treasonable correspondence with France caused his master to resign office. The discarded minister then set to work, aided by his cousin, to undermine the power of the Whigs, and in August 1710 Godolphin was dismissed, Harley being appointed Chancellor of the Exchequer and made head of the government. In 1711 occurred an event which raised Harley to the acme of popularity. A French priest and spy, who assumed the title of Marquis de Guiscard, being brought before the council on the 8th of March on the charge of treasonable correspondence with France, suddenly stabbed Harley in the breast with a penknife. His life was said to have been in danger, but he recovered, and was created Earl of Oxford and Mortimer, made a knight of the Garter, and in May appointed Lord High Treasurer of Great Britain. He was the last to bear this title; henceforth the chief adviser of the sovereign was known as the first minister to the crown, or the prime-minister. The principal act of Harley's administration was the treaty of Utrecht, the opposition of the Whig majority in the Upper House being overcome by the creation of twelve new peers. But Oxford's popularity was already on the wane; the friendship between him and Bolingbroke had degenerated into bitter jealousy, and was fast turning to hatred, and Mrs Masham sided with Bolingbroke. Moreover, Oxford estranged the Jacobites by his irresolution and want of a decided policy. On 27th July 1714 he was dismissed from office, his successor being Bolingbroke. Five days later, however, the queen died, and George I. was proclaimed king. In July of the following year Oxford was impeached and sent to the Tower, but after two years' imprisonment was acquitted by the Peers, and released. He spent the remainder of his life in retirement, the friend of scholars and men of letters, especially of Swift, and the founder of the Harleian collection of books and MSS. in the British Museum (q.v.). The Harleian Society, named from him, was founded in 1869 for the publication of heraldic visitations, &c. He died May 21, 1724. Harley was not a great statesman; the fault that marred his career was indecision of purpose, a desire to stand well with all parties. He followed no decided policy, but intrigued all round, not only with Whigs and with Tories, but also with the enemies of his country. Consequently he was distrusted by all parties and loved by none. See the *Harley Papers* (1897).

Harlingen (Frisian *Harns*), a seaport of the Netherlands, in the province of Friesland, on the Zuider Zee, 14 miles W. by S. from Leeuwarden. It has a good harbour (1875), protected from the sea by dykes. The manufacture of linen sacks and machines and shipbuilding are the chief industries. Butter and cattle are exported to England. Pop. 10,274.

Harmalin is a vegetable base, and *Harmin* another, both of which occur in the husk of the seeds of *Peganum harmala*, or Syrian rue, a zygophyllaceous, shrubby plant that grows abundantly in the steppes of southern Russia. The seeds have been used in dyeing silk, to which they impart various shades of red.

Harmattan, a hot desiccating wind, prevalent on the Guinea coast during December, January, and February, which blows from the interior to the Atlantic Ocean. It is generally preceded by clouds of extremely fine sand, called 'smokes' or 'fog,' which penetrates everywhere and covers everything. It has a hurtful effect on vegetation, and on the human body, drying up the eyes, nostrils, and mouth, and even causing the skin to peel off. The negroes protect themselves against it by rubbing the body with fat or grease. It has, however, the good effect of checking epidemics, and curing dysentery, fevers, and cutaneous diseases. The harmattan is similar to the Sirocco (q.v.) of Italy.

Harmodius and **Aristogeiton,** two Athenians strongly attached to each other, who in 514 B.C. murdered Hipparchus, the younger brother of the 'tyrant' Hippias, partly on account of an insult offered by him to the sister of Harmodius, and partly with a view to the overthrow of the Pisistratidæ. They meant to kill Hippias also, but Harmodius was cut down by the bodyguard of Hipparchus, whilst Aristogeiton fled, but was afterwards taken and executed. Subsequently they came to be regarded as patriotic martyrs, and received divine honours from the Athenians, and had statues raised to their memory. A beautiful drinking-song by Callistratus celebrates their deed.

Harmonica, a musical instrument, invented in 1760 by Benjamin Franklin, the sounds of which were produced from bell-shaped glasses, placed on a framework that revolved on its centre, while the rims were touched by the moistened finger. An instrument of the kind was used at Nuremberg in the 17th century. In 1746 the great composer Gluck, and in 1750 an Irishman named Puckeridge, played in London airs on a row of glasses, tuned by putting water into each. When Franklin finished his invention, in which the pitch was regulated by the size of the glasses alone, he found an excellent performer in Miss Marianne Davies, to whom he made a present of his harmonica, and who during 1762–73 performed on it with great effect in London, Paris, Vienna, Milan, Naples, &c. This fascinating instrument found many admirers, but none of them ever succeeded in improving it. The production of the sound by the points of the fingers caused such an effect on the nerves of the performer as in some instances to induce fainting fits. All attempts to make the harmonica easier for amateurs through means of keys ended in failure, since no substance was found to act as a substitute for the human finger. The harmonica gave rise to a host of similar instruments by Chladni, Kaufmann, and others, which were not particularly successful. Other instruments of no merit or importance took the same or a similar name, but had not the most remote resemblance to the original—e.g. steel pegs or strings being substituted for the glasses (see HARMONICON). The original harmonica, for which Mozart and Beethoven composed, was the instrument popularly known as musical-glasses. See Pohl, *Zur Geschichte der Glasharmonica* (1862).

Harmonica, CHEMICAL. This term is applied to the musical note which is evolved when a long dry tube, open at both ends, is held over a jet of burning hydrogen. A rapid current is produced through the tube, which occasions a flickering, and is attended by a series of small explosions, that succeed each other so rapidly and at such regular intervals as to give rise to a musical note, whose pitch and quality vary with the length, thickness, and diameter of the tube. See FLAME.

Harmonic Engine, an invention of Edison's, in which the energy of an electric current is used, by means of two small electromagnets, to keep up the vibrations of a large and heavily weighted tuning-fork. The arms of the tuning-fork are connected with two pistons which work a miniature pump, and this may compress air, which, in its turn, can drive sewing-machines or do other light work.

Harmonicon, a musical instrument consisting of glass or metal plates supported on strings at points about one-fourth of the length from the free ends. The plates are struck by soft hammers and enter into transversal vibrations, the frequency of which varies directly as the thickness, inversely as the square of the length, directly as the square root of the elasticity of the vibrating material, and inversely as the square root of its density. The points of support become nodal points.

Harmonic Proportion. Three numbers are said to be in harmonic proportion when the first is to the third as the difference between the first and second is to the difference between the second and third; otherwise, harmonic proportion is that which subsists between the reciprocals of numbers which are in arithmetical proportion. Thus, 3, 5, 7, &c., being in arithmetical proportion, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{7}$, &c., are in harmonic proportion. In geometry, a line

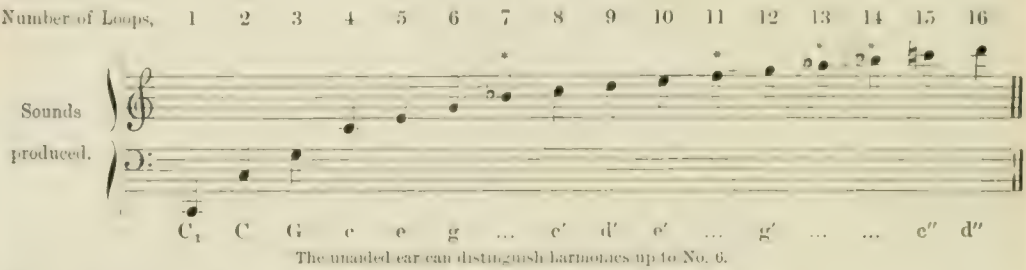
A C B D

AB is said to be harmonically divided when two points are taken, one in the line and the other in the line produced, as C and D, such that AC : CB : : AD : DB. When the line is thus divided, AD, CD, and BD are in harmonic proportion. A harmonic progression is a series of numbers in harmonic proportion, as the series formed by the reciprocals of numbers forming an arithmetical series.

Harmonics. Every musical sound, although to the untrained ear it appears to be single, will, on close observation, be perceived to consist of a principal or fundamental tone accompanied by higher tones or harmonics which blend and generally harmonise with it. The existence of such harmonics (or partial tones) may be perceived on loudly sounding a low note on a pianoforte with the loud pedal held down: as the sound dies away the harmonics become more and more prominently audible, especially when they are singly listened for one after the other; and the more tinkling the quality of tone of the instrument the more readily they are heard. In fact, in a tinkling pianoforte they are at all times louder than the fundamental tone, though they are masked by it, as all high tones appear to the ear to be masked by lower tones; and the tinkling quality is due to their presence. The peculiar recognisable character of all sounds—different voices, pianoforte, organ, violin, &c.—is due to the presence of harmonics, each with its own intensity; and by sounding along with a simple fundamental sound a number of harmonic tones, each with varying degrees of loudness, an

endless range of quality may be conferred upon the fundamental tone.

For demonstration of harmonics in sounds of all kinds a series of resonators is necessary. When a tuning-fork is vibrated near a hollow vessel of suitable capacity (say a lamp-chimney sunk in water to an adjusted depth), the air within the hollow vessel vibrates in unison with the fork and emits a loud sound; similarly, when the capacity of such a resonator corresponds to the pitch of a harmonic tone present in a given sound, the resonator sounds out that harmonic. By a series of such observations all the harmonics can thus be severally recognised. The physical basis of harmonic tones is the fact that no vibration of an elastic body is ever accomplished without a more or less well-marked division of the vibrating body into segments which vibrate independently and simultaneously. To realise this, take a long string stretched between two points; set it in vibration by means of a violin-bow; the cord will appear to vibrate as a whole. Now, by means of the finger-nail or of a stretched thread lightly pressed upon it at the exact mid-point, 'stop' the mid-point and again bow; the string will appear to vibrate in two independent halves or loops, with a node or point of rest between them; the vibrations will be twice as frequent as at first, and the sound produced will be the octave of that originally heard. Again, stop a point one-third of the length from either end and again set in vibration; two nodes and three loops will be formed; the vibrations will be three times as frequent, and the sound will be the twelfth above the original fundamental. In the same way, any point cutting off one aliquot part of the string may be stopped; the string will spontaneously form the corresponding number of nodes and loops when set, in any fashion, into vibration. If we suppose the original sound to have been C_1 on the second ledger line below the bass staff, the various sounds produced by treating the string in this way will respectively be:



The unaided ear can distinguish harmonics up to No. 6.

The notes marked with asterisks are not notes of the natural scale; 7 and 14 are a flat B♭ often to be heard in the sound of chime-bells; 11 is nearer F♯ than F♮; 13 is nearer to A than it is to G♯. Now, in a vibrating string all these vibrations co-exist; to what degree any one shall be present depends on the way in which, or the point at which, the string is bowed or struck or plucked; and the quality of the resultant note varies accordingly. From the harmonics the true ratios of the members of the diatonic scale may be found—e.g. *b'* has a frequency of vibration 15 times as great as that of C_1; whence B_1 has a frequency $\frac{15}{8}$ times as great; and so for the rest, as follows:

Notes of the scale of C	C	D	E	F	G	A	B	C
Notes of any diatonic scale in general	d	r	m	f	s	l	t	d'
Ratios	1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	2

For the modification in these ratios introduced by the system of temperament, see TEMPERAMENT. The standard work on Harmonics is Helmholtz's *Sensations of Tone* (trans. by Mr Ellis; 2d ed. 1885).

Harmonists. See RAPP.

Harmonium, a musical instrument, for the invention of which many claims have been advanced. The arrangement by which the sounds of the harmonium are produced is called the *free vibrating reed*, supposed to have been a modern discovery, but now ascertained to have been known in China long before it was ever heard of in Europe. Its construction is as follows: A narrow rectangular slit being made in a piece of brass-plate of a quarter of an inch in thickness, a thin elastic spring of the same metal, and of nearly the exact breadth of the slit, is fixed at one end by two small rivets to the surface of the plate, close to one end of the slit, and is so adjusted that it fills the area of the slit, and, when pressed into it at the free end, can pass inwards without touching the end or the sides of the slit, and when left to itself it can return back to its position of covering the slit. The spring at the free end is permanently bent a very little outwards. When a current of air is forced through the slit, the spring is put into vibration, and produces a continuous musical sound, acute or grave, according to the rapidity or slowness of the vibrations. This kind of reed is termed 'free,' in contradistinction to the reed of the organ-pipe, the spring or tongue of which entirely covers an oblong slit, in the side of a brass tube closed at one end, and vibrates against the cheeks or outside of the slit, instead of within it.

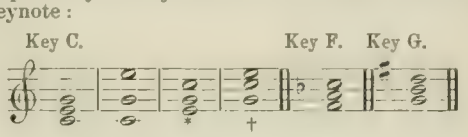
After many attempts, in various countries, to construct a keyed instrument of really a useful kind with the free reed, Debain of Paris produced his invention (1840) of the harmonium, which became more or less the model of all the others that have followed. The harmonium occupies comparatively little space, being only about 3 feet 3 inches high and 4 feet broad, the depth being according to the number of the stops, usually from 20 to 23 inches. It has a compass of five octaves of keys from C to C, the key-board being placed on the top, immediately below the lid. Under the key-board is the bellows-board, in which are valves for each key; while above the valves are the different rows of reeds. The sizes of the reeds differ, according to pitch, from about 3½ inches long to ½ inch; and the quality of sound is affected and modified by the breadth of the vibrating part of the reed, and the shape of the aperture in the bellows-board covered by the valve. The pressure of wind is from a bellows with two feeders, which the player moves alternately with his feet, filling a reservoir, similar to the bellows of a small organ. When a key is pressed down, the valve opens, and the wind, which has access from

the bellows to the wind-chest, rushes through the slit of the reed, and produces a sound which continues as long as the valve is kept open. It is a peculiarity of the free reed that an increase or a diminution of the pressure of wind does not alter the pitch of the sound, but merely increases or diminishes its volume. Advantage may be taken of this peculiarity by the harmonium-player to effect a *crescendo* or *diminuendo* by gradually augmenting or decreasing the pressure of the wind. The vibrations of the spring being like those of a pendulum, isochronous, remain fixed in rapidity or slowness, according to the length and elasticity of the vibrating slip of metal, and thus regulate the pitch of the sound without reference to the pressure of wind. For the deep bass-notes the springs are heavily loaded at the loose end, to make them vibrate slowly; while in the higher notes they are made thinner at that end.

Harmoniums are made of various sizes, and from one row of reeds (or vibrators, as they are now called) to four or more rows. Each row is divided near the middle, between an E and F; and each half has its separate draw-stop. Knee-pedals are sometimes added for producing the same modifications of tone as the swell on the organ. Some harmoniums are made with two rows of keys, thus affording a greater variety in playing solo with an accompaniment; and for more skilful performers, pedals for the feet, similar to organ-pedals, are attached. The manufacture of the harmonium in Paris has, of late years, increased almost incredibly. The various parts of the harmonium can be obtained there ready-made, from a single reed to a complete set. The best-known makers are the Alexandres and Mustel in France, and Bauer in England. The *Seraphine* was a similar but much inferior instrument. The *American Organ*, introduced in 1861 by Messrs Mason & Hamlin, is a kind of harmonium which acts by wind exhaustion or suction, and instead of force bellows, works by exhaustion bellows. Its tone is softer, and its timbre less reedy; it is also easier to play. But the true harmonium is capable of higher treatment. The *percussion action* for the harmonium is due to a small hammer like that of a pianoforte, which strikes a blow on the vibrator the moment the key is pressed down, and sets it instantly into vibration, thus assisting the action of the wind. The *expression* stop—an invention of the Alexandres, father and son—is used almost continuously by the best players on the instrument, but is very difficult to manage. By the action of this stop, the air-reservoir is cut off, and the pressure becomes entirely dependent on the management of the bellows. The latest invention of importance is the *melody-attachment* of Dawes—the date of the patent was 1864—which gives predominance to any special note or notes in the upper part of the harmony, by a contrivance which shuts off all notes except the highest, in certain registers of a combination. Harmoniums may now be had of various sizes and qualities, at prices from £5 to £120. Valuable for accompanying psalmody, they suitably take the place of organs in temporary places of public worship, or among the less opulent class of congregations; but of late years the French school of players, headed by M. Lemmens, have treated the harmonium with success as a brilliant solo instrument. For domestic use, harmoniums are not likely to supersede the pianoforte; but possessing the important advantage of not going out of tune through humidity of atmosphere, they will be found available in climates where pianos cannot properly be kept.

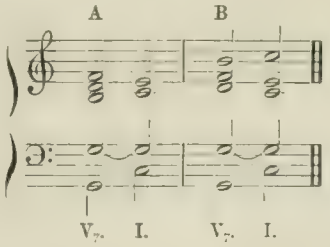
Harmony, paradoxical as it may seem to the lay mind, is the science of discord. It treats of the laws which control the relationship of one chord or set of chords to others, and which decide the relation to the fundamental concord of the dissonant elements in a discord.

Concords.—A chord or combination of several tones in any scale or key may be a concord or a discord. The one concord in a key consists of the tonic or keynote and the notes which are respectively a major third and a fifth above the keynote:

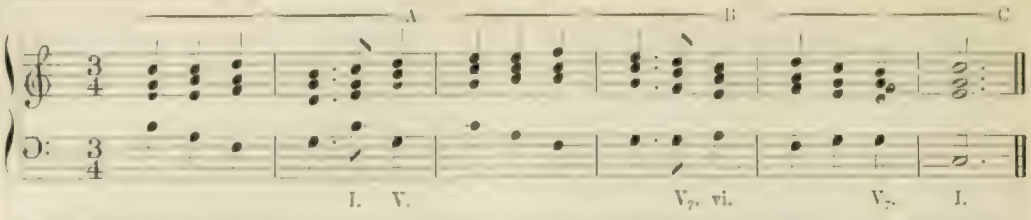


* and † are respectively the first and second 'inversions' of the chord. These three are the notes which nature gives us as producing a perfect sound in combination (see HARMONICS); they are therefore called 'consonances,' and any foreign element is a 'dissonance.' This 'common chord' or 'triad' makes a starting-point and a point of finality from which the harmonies proceed, round which they rally from time to time, and into which finally they resolve themselves. It is with few exceptions the first and invariably the last chord in any composition. One dissonance suffices to change a concord to a *discord*, which can be effected by adding to the notes of this common chord, or by changing their relationship to each other, &c.; and the fundamental law of harmony is that discord *as an incomplete idea* must give place to concord before the ear can be satisfied. This process is called 'resolving' the discord. Thus concords stand firm like the straight lines or outstanding features in a landscape; while discords supply the curved lines of beauty, the effects of perspective, and the variety which gives interest to the picture.

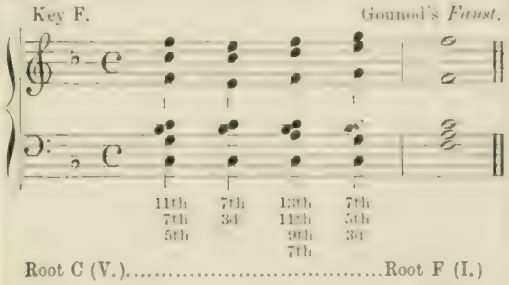
Discords.—The seventh harmonic of nature which is a minor seventh distant from the root—i.e. one semitone *less* than the seventh consecutive note in an ascending major scale—produces a discord which, with its complementary or *fulfilling* concord, is the foundation of all harmony. This discord is called the DOMINANT SEVENTH (its sign is V_7.), and its 'resolution' is the triad of the key to which it belongs—i.e. the chord of the tonic (I.).



A is an example of 'close,' B of 'open' or 'extended' harmony. Because the discord on G seems thus to demand the chord of C as its resolution, the note G (or similarly the fifth degree in any scale) is called the *dominant* (V.) of that key, and the chords and discords built on it constitute the dominant harmonies. Position B is the most satisfactory to the ear, because of the effect of finality induced by the resolution to the first position of the triad; and the two chords together form the *dominant* or *authentic cadence*—the most important of those terminal phrases which serve in music much the same end as commas, semicolons, and periods in composition. 'God save the Queen' offers examples of two other important cadences, showing at the same time how these mark the completion of more or less final musical periods.



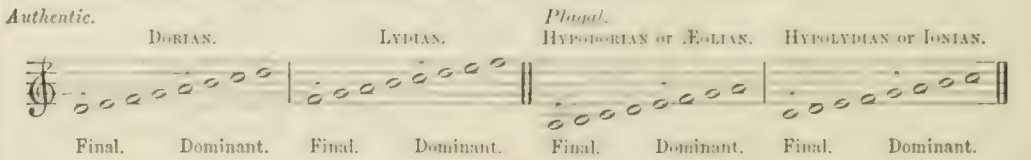
The first period is closed at A by a 'half' or 'imperfect' cadence—i.e. the order V.—I. is reversed; the second at B by a 'false' or 'deceptive' cadence—i.e. the dominant chord, instead of proceeding to the tonic, 'deceives' the ear by proceeding to another chord; the third period is brought to a close by the authentic cadence at C.

The dominant chord can also bear the more elaborate dissonances of the ninth, eleventh, and thirteenth, as well as the seventh.

Root C (V.).....Root F (I.)

It is impossible here to enter into the varieties of discord—'suspensions,' 'double-root chords,' &c., into the analogous discords which may be built on the tonic as a ground-note, or the chords belonging to the minor scale. Suffice it to say the effects which can be evolved from the almost innumerable inversions and involutions of single chords and combinations of chords are subject to natural laws as stringent as those governing the growth of flowers and trees, and the possibilities of variety in this unity are as infinite.

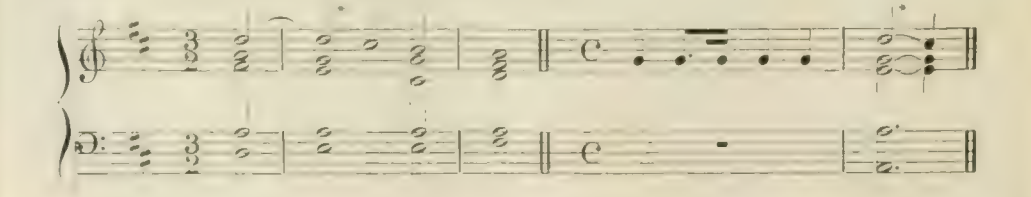
Modulation. One branch of the subject can hardly be left without mention—i.e. *modulation* or change from one key (or 'mode') to another. Our modern scales have had the relation of their intervals so modified (see TEMPERAMENT) as to be approximately alike. By the addition of a single sharp or flat any melody can proceed from the key of C to G (with F♯), F (with B♭), or A minor (with G♯). These—the dominant, subdominant (next below the dominant), and the minor of the sixth degree—are the keys of the *first relation*, as out of the seven notes which constitute each scale six are present in the scale of C, thus providing as it were six more or less convenient bridges by which to pass from one key to the other. The conventionality of these modulations makes them inadequate to convey the more passionate colouring of modern music, and more striking changes to remoter keys are necessary. A favourite device with modern composers is to take advantage of the 'tempered' system, and by using one note in two significations (e.g. F × E♯) to secure means of startling and also of very tender effects in modulation.

History. The complete Greek scale as formulated by Pythagoras is represented by three octaves of our scale of A minor, beginning at the A in the first space of the bass clef, and using no black notes. Various sets of eight notes selected from this extensive scale were called after districts of Greece, and in the 4th century St Ambrose adopted four of these names when he laid the foundation of modern music in what are called the Gregorian Modes. They received their name from Pope Gregory, who added four others beginning on the respective dominants, and called them *plagal*, as distinct from the *authentic* modes of St Ambrose. The most important of these are



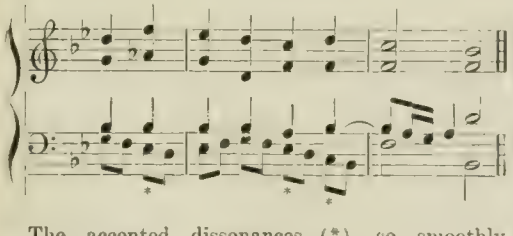
The Dorian and Æolian, and less frequently others even more at variance with our conventional scale, are still in occasional use; and peculiarly plaintive effects can be obtained from the absence of the 'sharp seventh' to which our modern ears are so accustomed.

In Counterpoint, the science which preceded harmony, attention was given altogether to the correct progression of the individual voices or parts, while the combinations made by the voices at any moment were regarded as merely accidental. But unconsciously the ear of musicians was being cultivated, and the richness of Palestrina's simpler writings must have shown the possibility of obtaining undreamt-of effects from chords as integral units in a march of harmonies, rather than accidental combinations of independent melodies. One of the fundamental rules of counterpoint was that a dissonance must either be 'prepared'—i.e. it must appear as a consonance in the previous chord—or else it must be approached very gradually. This rule of the old science was disregarded by Monteverde (1608), who used unprepared discords, and thus at one blow the new feeling for chords was released from its bondage to counterpoint.



The chords at * present the same discord—the eleventh and seventh on A, the dominant of D. The first is carefully prepared, and so has a smooth effect; the second is quite 'free' in its entry, and has a sudden and startling effect.

Only one who understands counterpoint and harmony can appreciate the full importance of the new departure. It meant that discords were no longer mere variations of concords, but individual creations with an individual's rights and duties. The discord most easily used was the dominant seventh, the first discord produced by nature's harmonics; and so the relation of dominant to tonic—the central idea of all harmony—developed from an increasingly general tendency into a recognised rule. During the 17th century many experiments were made by Monteverde's followers, until at the end of the century Rameau's famous treatise called attention to the fact that all chords are derived from some note which is the generator or root, and the relationships of these roots govern the progressions of the harmonies. The less known, but hardly less important, researches of Tartini formed a good supplement to Rameau's theory; and the basis of scientific harmony established by these two works has not been seriously disturbed even by the thorough investigation and the astonishing discoveries of Helmholtz, who has extended the foundation and built a complete superstructure thereon. In the meantime, while theorists fought each other with great fierceness just as their successors do to-day, the science made extraordinary progress under such practical harmonists as Bach, Mozart, and Beethoven. Bach's daring but unerring feeling for harmony, his grasp of the mysteries of chord-relationship, and his unequalled skill in part-writing enabled him as early as the beginning of last century to transform an ordinary progression of simple chords into such a passage as



The accented dissonances (*), so smoothly introduced and yet so striking, are extremely effective. Haydn's work, and Mozart's also, is considerably softer; their use of discord proved insufficient for the expression of the great passion which is the feature of Beethoven's later work. The romanticism of Schumann required still freer scope, and Wagner, who handles any number of parts as easily as did Bach himself, has enlarged the possibilities of harmony so far that it is difficult to conceive of any further advance. Theoretical harmonists have followed fast in the train of these great composers, and, as system after system proved inadequate for the analysis of new harmonies or new uses of old harmonies, the revered names of each generation have been pushed aside more or less contemptuously by succeeding schools.

Among the most famous works on harmony are those by Rameau, Logier, and Dr Day; Richter's text-book long used at Leipzig Conservatorium is a very good example of last generation's guide: and it is England's proud boast to-day that the attempt to reconcile theory with practice is most successful among her musicians. Sir George Macfarren's *Harmony* is founded on Dr Day's system; Sir Frederick Ouseley's is even more scientific; and probably the most successful, as well as certainly the most readable of all, is Sir John Stainer's *Theory of Harmony*. Sir George Macfarren's six *Lectures*, delivered at the Royal Institution, give an exhaustive and popular account of the progress of harmony; and more technical readers will find much that is instructive in Dr Parry's brilliant article in Grove's *Dictionary of Music*.

Harmony of Gospels. See GOSPELS.

Harms, CLAUS, German divine (1778–1855), whose memorial work, *Das sind die 95 Theses oder Streitsatze Luthers* (1817), in celebration of the tercentenary of the Reformation, produced a sensation in Germany.

Harnack, THEODOSIUS, a Lutheran theologian, was born at St Petersburg in 1817, and studied at Dorpat, where he was professor of Theology from 1848 to 1853, next till 1866 at Erlangen, and again at Dorpat till his retirement in 1873. He died in 1889. His principal works are his *Praktische Theologie* (3 vols. 1877–82) and *Katechetik und Erklarung des kleinen Katechismus Luthers* (2 vols. 1882). —Of his sons, all of whom have attained to some distinction, the most famous is ADOLF, who was born 7th May 1851 at Dorpat, where he studied from 1869 to 1872. He was appointed *privat-docent* for church history at Leipzig (1874), extra-ordinary professor there (1876), and ordinary professor successively at Giessen (1879), Marburg (1886), and Berlin (1888). His chief writings are *Zur Quellenkritik der Geschichte des Gnostizismus* (Leip. 1873); *Die Zeit des Ignatius und die chronologie der antiochenischen Bischofe* (Leip. 1878); *Das Monchtum, seine Ideale und Geschichte* (2d ed. Giessen, 1882); *Lehrbuch der Dogmengeschichte* (3 vols. 1886–90; Eng. trans. 1894–97); *Die Geschichte der altchristlichen Litteratur* (vol. i. 1893). *The Outlines of the History of Dogma* (trans. 1893) is a translation of the *Grundriss* (2d ed. 1893). Prussian orthodoxy was greatly scandalised by his treatment of the Apostles' Creed in *Das Apostolische Glaubensbekenntniss* (1892), and agitated for his removal from his post. In conjunction with Von Gebhardt and Zahn he edited the *Patrum apostolicorum opera* (3 parts, Leip. 1876–78); and with Von Gebhardt alone the *Texte und Untersuchungen zur Geschichte der altchristlichen litteratur* (12 vols. 1882–94). He was also joint-editor of the *Theologische Litteraturzeitung* established by Schürer (1876). — AXEL, Adolf's twin-brother, who died in 1888, was a distinguished mathematician, and wrote on the calculus; ERICH, another brother, became a professor of Physiology at Halle; and a fourth, OTTO, wrote on Goethe.

Haro, a town of Spain, 31 miles by rail NW. of Logroño, is prettily situated on the right bank of the Ebro. Good red wine is grown in the neighbourhood. Pop. 7600.

Haro, THE CRY OF, an old form of appeal in Normandy and the Channel Islands. The word was anciently understood to be an appeal to Rolf, Rollo, or Rou, the first Duke of Normandy; a better derivation seems to be from the Old High German *hera* or *hara*, 'here,' making haro simply a cry for aid.

Haroëris, the elder Horus, son of *Seb*, the Egyptian Saturn, and *Nu*, or Rhea. He was the brother, and not the son, of Osiris; and he was ruler over the heaven. He was identified with the sun and Apollo. See EGYPT (Vol. IV. p. 235).

Harold I., surnamed HAREFOOT, king of England, was the younger of Canute's two sons by his first wife, Alfgiva. On the death of Canute in 1035, the witan bestowed upon Harold all the provinces north of the Thames; while the possession of Wessex in the south was given up to Canute's second wife, Emma, for her son Hardicanute. But in 1037 Wessex also submitted to Harold. Beyond a futile invasion of the country by Alfred, son of Ethelred, and raiding incursions by the Welsh and Scots, Harold's reign was

marked by no events of importance. He died at Oxford in March 1040.

Harold II., the last of the native English kings, was the second son of Earl Godwin by his Danish wife Gytha, the sister of Earl Ulf, and was born about 1022. At an early age he was made Earl of the East Angles, and he shared his father's outlawry in 1051, finding a refuge in Ireland. Next year, together with his brother Leofwin, he crossed the Channel with nine ships, defeated the men of Somerset and Devon at Porlock, and ravaged the country, next joined his father at Portland, and shared the triumph of his return. Harold was at once restored to his earldom, and next year (1053) succeeded to his father's earldom of the West Saxons. Henceforward he was the right hand of King Edward, and still more after the deaths of the old Earls Leofric and Siward, he directed the whole affairs of the kingdom, with an unusual union of gentleness and vigour. His brother Tostig succeeded Siward as Earl of the Northumbrians in 1055, and two years later two other brothers were raised to earldoms: Gurth to that of the East Anglians, Leofwin to one formed out of Essex, Kent, and the other shires round about London. Meantime Harold drove back the Welsh marauders of King Griffith out of Herefordshire, and added that post of danger to his earldom. The death in 1057 of the Ætheling Edward, the son of Edmund Ironside, who had been brought back from Hungary as heir to the throne, opened up the path for Harold's ambition, and from this time men's eyes rested on him as their future king. And nature had equalled fortune in her kindness, for his handsome and stalwart figure and his gentle and conciliatory temper were kingly qualities that sat well upon his sagacity, his military skill, and his personal courage. Harold's policy throughout was thoroughly English, contrary to the predominant French influences that had governed the early part of Edward's reign. He was English in everything, even to his preference for secular priests to monks. He made his pilgrimage to Rome in 1058, and after his return completed his church at Waltham, known later as Waltham Abbey. In 1063, provoked by the fresh incursions of Griffith, he marched against him, and by making his men put off their heavy armour and weapons, and adopt the Welshmen's own tactics, he was able to traverse the whole country, and beat the enemy at every point. Griffith was killed by his own people, whereupon Harold gave the government to the dead king's brothers, Bleddyn and Rhiwallon, who swore oaths of fealty both to King Edward and to himself.

It is impossible to say exactly at what date occurred that famous visit of Harold to the court of Duke William in Normandy, of the results of which the Norman writers make so much, although with many contradictions, while the English writers with the most marked and careful unanimity say nothing at all. It seems most likely that Harold did make some kind of oath to William, most probably under compulsion, when he had fallen into his hands after being shipwrecked on the coast of Ponthieu, and imprisoned by its Count Guy. Mr Freeman thinks the most probable date to be 1064. It is at least certain that Harold helped William in a war with the Bretons, and in the Bayeux tapestry we see his stalwart form lifting up two Normans at once when they were in danger of being swept away by the river Coesnon which divides Normandy from Brittany. The Norman writers make Harold formally swear fealty to William, promising to marry one of his daughters, and we are told that additional sanctity was given to this oath by its being made upon a chest full of the most sacred relics.

In 1065 the Northumbrians rebelled against the rule of Tostig, and Harold found himself compelled between policy and a sense of justice to side with them, and to acquiesce in their choice of Morcar and the banishment of Tostig. At the beginning of 1066 King Edward died, his last breath being to recommend that Harold should be chosen king. He was crowned on January 6, and at once set himself with steadfast energy to consolidate his kingdom. At York he won over the reluctant men of Northumbria, and he next married Ealdgyth, Griffith's widow, in order to secure the alliance of her brothers, Morcar and Edwin. His short reign of forty weeks and one day was occupied with incessant vigilance against the attacks of two formidable enemies at once. Duke William lost no time in beginning his preparations for the invasion of England, and Tostig, after trying the Normans and the Scots, and filibustering along the coasts on his own account, succeeded in drawing to his side the famous Harold Hardrada, king of Norway. In the month of September the two reached the Humber, and Harold marched to meet them, resting neither day nor night. The Icelandic historian Snorro in his dramatic narrative of the fight tells how Harold rode out accompanied with twenty of his housecarls to have speech with Earl Tostig and offer him peace, and when asked what amends King Harold should have for his trouble in coming, replied, 'Seven feet of the ground of England, or more perchance, seeing he is taller than other men.' At Stamford-bridge Harold overtook his enemy, and after a bloody struggle won a complete victory (September 25, 1066), both Tostig and Harold Hardrada being among the slain. But four days later Duke William landed at Pevensey. Harold marched southwards with the utmost haste, bringing with him the men of Wessex and East Anglia and the earldoms of his brothers; but the two earls Edwin and Morcar held aloof and kept back the men of the north, although some of the men of Mercia, in the earldom of Edwin, followed their king to the fatal struggle which was fought out from nine in the morning till past nightfall on the 14th October 1066. The English fought with the most stubborn courage, and the battle was only lost by their allowing the pretended flight of the Normans to draw them from their impregnable position on the crest of the hill, ringed with an unbroken shield wall. On its slope right in front of the Norman army waved the golden dragon of Wessex, as well as the king's own standard, a fighting man wrought upon it in gold. Here Harold stood with his mighty two-handed axe, and hewed down the Normans as they came. Before nightfall he fell pierced through the eye with an arrow. His housecarls fought where they stood till they fell one by one; his brothers Gurth and Leofwin died beside him. The king's body was found upon the field, recognised only by a former mistress, the fair Eadgyth Swanneshals ('Edith of the swan's neck'). At first William ordered it to be buried on the rocks at Hastings, but seems after to have permitted it to be removed to Harold's own church at Waltham. Than Harold no braver or more heroic figure ever filled a throne; no king ever fought more heroically for his crown. If he failed, it was because he had to bow his head to fate, and in his death he saved all the honour of his family and his race. His tragic story has given a subject for a romance to Lytton, and for a stately drama to Tennyson. For the history, see vols. ii. and iii. of Freeman's *History of the Norman Conquest*.

Harold I., surnamed HAARFAGER ('Fairhaired'), the first king of all Norway, was the son of Halfdan the Black, the most powerful of the jarls or petty kings of south-eastern Norway. According to the popular story, he loved a high-

born maiden named Gyda, but she declared she would not be his wife until he was sole king of Norway; he in his turn thereupon took an oath that he would neither cut nor comb his hair until he had accomplished her bidding. After a severe struggle of some years' duration (863-872) he subdued, first the chiefs between Throndhjem and the Sogne Fjord, and finally the kings of the south-west, whom he defeated in a naval battle near Stavanger. The conquered districts he placed under the rule of his own jarls, or such as were devoted to his service. This led many of the old nobles to emigrate to the Orkneys, the Hebrides, and to Iceland, whence they conducted a series of piratical expeditions against Norway, until at length Harold was constrained to sail westwards and chastise them in their own seas. In his old age Harold divided his territories amongst his sons, and died at Throndhjem, which he had made his capital, in 930, leaving the supreme power to his son Eric, surnamed Bloody-Axe.

Harold III., surnamed HAARDRAADE or HARDRADA ('stern in council'), king of Norway, and one of the most famous of the old Viking chiefs, was a descendant of Harold I. Whilst still a boy he was present at the battle of Stikklestad (1030), in which his brother, St Olaf, king of Norway, was slain. Harold himself sought an asylum at the court of his relative, Yaroslaff, prince of Novgorod. Thence, going on to Constantinople, he became captain of the Varangians or Scandinavian bodyguard of the Greek emperors, and in command of them defeated the Saracens in several battles in Sicily and Italy. On his return to Constantinople, he drew upon himself the vengeance of the Empress Zoe, whose proffered love he rejected, and with difficulty made good his escape to Russia, where he married the daughter of Duke Yaroslaff. But he did not remain in Russia. He returned about 1045 to Norway, where his nephew, Magnus (the son of St Olaf), agreed to divide the supreme power with him, in exchange for a share of his treasures. The death of Magnus in 1047 left Harold sole king of Norway, and Svend king of Denmark; but with Svend Harold waged unrelenting war until 1064. This king changed the capital of Norway from Throndhjem to Opslo, now a suburb of Christiania. Two years later he landed in England, to aid Tostig against his brother Harold, king of England, but was slain in battle at Stamfordbridge, where also the flower of his warriors fell.

Haroun, surnamed AL-RASCHID (more properly Harún er Rashíd, 'the orthodox'), the most renowned of the Abbaside califs, was born in 763, and succeeded his elder brother, El Hádi, in the califate, in the year 786. He owed his peaceful accession to the sagacity of the Barmecide Yahya, whom he at once made his grand-vizier. To him and his four sons he left the entire administration of his extensive kingdom; and the energy of their administration, the enforcement of order, and the general prosperity of the country proved that his confidence was not misplaced. Meantime Haroun gave himself up to the pleasures of life, and his own taste and hospitality quickly made his court at Bagdad a brilliant centre of all the wit, learning, and art of the Moslem world. Himself an accomplished scholar and poet, he gathered round him the best scholars, poets, and musicians of his age, and heaped rewards upon them with lavish prodigality. Towards the end of his reign a strange and deeply-rooted hatred towards the Barmecides (q.v.) filled his mind, and in 803 he caused the vizier, his four sons, and all their descendants save one, to be executed, not even excepting his favourite Jaafer (Giafar), who had been his constant companion in his famous but apocryphal nocturnal rambles through the streets of Bagdad. But the retribution of heaven quickly followed; his affairs fell into irretrievable confusion; treason and rebellion, no longer dreading the far-reaching arm of the able vizier, showed themselves in every corner of the empire; and, when it was too late, Haroun repented bitterly his ferocious cruelty. To quell a formidable rising in Khorassan, in the north-east of the empire, Haroun marched in person against the rebels, but an attack of apoplexy obliged him to remain behind in Tûs, where he soon afterwards died, in the month of March 809. Haroun the Magnificent is the hero of many of the stories in the *Arabian Nights*, which have thrown a false halo round his memory; for with all his enlightenment, there was room in his heart for the most merciless and blood-thirsty ferocity. See Gibbon's *History*, Weil's *Gesch. der Chalifen*, and Professor E. H. Palmer's sketch in the 'New Plutarch' series (1880).

Harp, a musical stringed instrument, much esteemed by the ancients. In Egypt it attained an early and unequalled maturity, and is delineated in the sculptures from the earliest ages in many different forms. The great Egyptian harp stood nearly 7 feet in height, and carried 18 sonorous bass and tenor strings. Its immense frame shimmered with all the colours of the rainbow, and was further ornamented with massive carvings, gold, and precious stones. The Assyrian and biblical harp was a small instrument, easily carried in the hand, and resembling more a Lyre (q.v.) than a true harp. The harp was not in use among the Greeks and Romans; but the *kantela*, to which the Finns chanted the *Kalevala*, was a sort of primitive harp. The Celtic bards held the instrument in the greatest honour. The old Scottish harp was about 3 feet high, a foot and a half broad, and carried about thirty strings. Seven harps earlier than the 18th century are in existence, and are described in Hipkins' *Musical Instruments, Historic, Rare, and Unique* (1889). The Welsh triple harp is a large instrument, furnished with three rows of strings. Of these, two rows are tuned in unison and in the diatonic scale, the remaining one in the sharps and flats of the chromatic. In Ireland the harp was so celebrated an instrument in the remotest times that the Italians of the middle ages believed their harp to be derived from Ireland. The most familiar forms of harp are the Italian, the medieval, and the pedal harp. The first is strung with two rows of wire-strings, separated by a double sound-board; this kind is now little used, being very imperfect. The second is in the form of a triangle, with a sound-board and gut-strings; it is always tuned in the principal key of the music, while the strings are altered to suit any modulations out of the key, by pressure of the finger, or turning the tuning-pins of certain notes. The adaptation of the harp to the modern chromatic scales led to the invention of the pedal harp, which has seven pedals, by which each note of the diatonic scale, in all the different octaves, can be made a semitone higher. The compass of the pedal harp is from contra F to D of the sixth octave above. In order to have the B flat, it must be tuned in the key of E flat. The music for the harp is written in the bass and treble clef, the same as pianoforte music. A celebrated harpist, Hochbrucker, in Donauwörth, invented the pedals in 1720; others say they were invented by J. Paul Verter, in Nuremberg, in 1730, who at least added the piano and forte pedal. The facility of playing chromatic intervals, and in different keys, was still more completely attained by the invention of the double-action pedal harp by Erard in Paris, in 1810. By means of Erard's invention, each string can be sharpened twice, each time a

semitone, so that the C string may be C flat its full length, C natural by the first movement of the pedal, and C sharp by the next movement. The double-action harp is tuned in the key of C flat.

Harpe, JEAN FRANÇOIS DE LA. See LA HARPE.

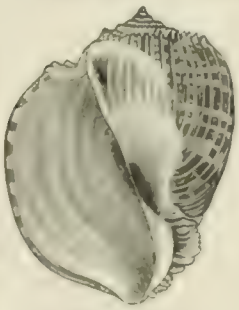
Harper and Brothers, a well known firm of New York publishers, consisted originally of James (1795–1869), John (1797–1875), Joseph Wesley (1801–70), and Fletcher (1806–77). James and John commenced to publish in 1818, and, under the style of J. & J. Harper, issued about 200 works. The firm of Harper and Brothers was established in 1833, and is now carried on by the descendants of the founders; it has large publishing premises in New York city. Besides books, the firm issues *Harper's Magazine* (monthly, since 1850), *Harper's Weekly* (since 1857), *Harper's Bazar* (fashions, social life, &c.; since 1867), and *Harper's Young People* (since 1881). The firm was reorganised in 1899.

Harper's Ferry, a post-village of West Virginia, situated among beautiful scenery at the confluence of the Shenandoah with the Potomac, where the latter is crossed by a bridge, 81 miles W. of Baltimore by rail. It was the scene of John Brown's abolition raid in 1859; and here a Union army of over 11,500 men, under General D. H. Miles, surrendered to Stonewall Jackson in 1862. The arsenal and armoury were burned in 1861, to prevent their falling into the hands of the Confederates. Pop. 764.

Harpocrates, the name given by Greek writers to the younger Horus, the hieroglyphical inscriptions calling him *Har pa khrut*, 'Horus the child,' the son of Osiris and Isis. See OSIRIS, EGYPT (Vol. IV. p. 235), ISIS.

Harpoon. See WHALE.

Harp-shell (*Harpa*), a genus of gasteropodous molluscs of the whelk family (Buccinidæ), having the last whorl of the shell large, and covered with numerous sharp smooth ribs, resembling the strings of a harp. The foot is large, and there is no operculum. These shells are elegantly marked, and much prized for their beauty. Nine species are known, all of them tropical, and living in deep water, on soft, sandy, or muddy bottoms.



Harp-shell (*Harpa imperialis*).

Harpsichord, a keyed musical instrument, formerly in extensive use, but now little known. There were three shapes: the 'grand' form, resembling a grand piano; the oblong, often called spinet or virginal; and the upright, this type very rare. The sound from the strings was produced by a small piece of crow-quill, or a piece of hard leather, which projected out of a slip of wood, called the jack, that stood upright between the strings, and was pushed upwards by the key, till the quill or leather twitched the string, causing a brilliant, but somewhat harsh sound, entirely deficient of any means of modification in respect to loudness or softness. Specimens of the harpsichord, although now becoming more rare, are still to be found in good preservation, but are regarded rather as articles of vertu or curiosity than as useful musical instruments. Many Italian and Dutch harpsichords were highly ornamented by the most eminent artists with valuable panel paintings on the inside of the lid. The date of the invention of the harpsichord is uncertain. It is first mentioned in the rules of the Minnesingers by Eberhard Cersne, in 1404, which places its invention in the preceding century. It was known in England in the 15th century, as mention occurs of it in a MS. dated 1502, where it is alluded to as no novelty. The Ruckers family were the great makers in Antwerp in the 16th and 17th centuries. In the 18th century Kirkman, and later Broadwood and Shudi, were the famous makers in London. The harpsichord will be remembered in history as the instrument on which Bach and Handel played. After the invention of the pianoforte, the harpsichord in all its varieties was gradually superseded by the new instrument. See PIANOFORTE.

Harpy, a fabulous creature in Greek mythology, considered as a minister of the vengeance of the gods. Various accounts are given of the numbers and parentage of the Harpies. Homer mentions but one, Podarge; Hesiod enumerates two, Aëllo and Okypete, daughters of Thaumas by the Oceanid Electra, fair-haired and winged maidens, very swift of flight. Three are sometimes recognised by later writers, who call them variously daughters of Poseidon or of Typhon, and describe them as hideous monsters with wings, of fierce and loathsome aspect, with their faces pale with hunger, living in an atmosphere of filth and stench, and contaminating everything that they approached. The most celebrated tradition regarding the Harpies is connected with the blind Phineus, whose meals they carried off as soon as they were spread for him, a plague from which he was delivered by the Argonauts, on his engaging to join in their quest. The Boreads Zetes and Calais attacked the Harpies, but spared their lives on their promising to cease from molesting Phineus. Virgil locates them in the Strophades.—A harpy in heraldry is represented as a vulture, with the head and breast of a woman.

Harpy Eagle (*Thrasaëtus harpyia*).

The name harpy is also applied to a raptorial bird of the family Falconidæ (*Thrasaëtus harpyia*), an inhabitant of the great tropical forests, where it preys upon all quadrupeds, except the most powerful, chiefly, however, on monkeys and sloths; even children are said to have been carried off by it. It

is somewhat larger than the golden eagle (measuring 38 inches in length as against 32), and its beak and talons are exceptionally large, giving it a ferocious aspect; but its wings are comparatively short, and its flight, for a hawk, is slow and heavy. Its colour on the back and sides of the neck, on the back and on the wings, is black; the head gray; the front of the neck, breast, and belly white; the tail black and gray above, black and white in transverse bands below. Around the eyes the feathers are disposed in a radiating fashion, and form a crest on the back of its head, increasing the ferocity of its aspect. It inhabits the tropical regions of South America.

Harquebus. See ARQUEBUS.

Harrar. See HARAR.

Harrier, a breed of dog used to hunt the hare by scent. The harrier probably owes its origin to the foxhound, though in some packs the strain has been kept pure for many generations. In appearance the harrier closely resembles the foxhound both in shape and colour, but is on a considerably smaller scale. The harrier, though deficient in speed, is able to hunt a much colder scent than the foxhound. They hunt in packs; and the sport forms an element in English country life similar to foxhunting.

Harrier (*Circus*), a genus of non-arboreal Falconidæ, of slender build, with a somewhat weak, unnotched bill, with soft plumage and a slightly owl-like ruff on the face, with long legs and wings, and a characteristic gliding flight along the ground.

Hen-harrier (*Circus cyaneus*).

They live in the open country, are fond of marshy districts, and dexterously catch frogs, birds, and small mammals. The females are usually larger and darker than the males; the young are like the mother-birds; the nest is almost always on the ground, and the eggs (3 to 5) are white or blotched. The British species of harrier are (1) the Hen-harrier (*C. cyaneus*), almost exterminated in England, but still not uncommon in some parts of Scotland; (2) the Marsh-harrier or Moor-buzzard (*C. æruginosus*), all but exterminated throughout Britain; and (3) Montagu's Harrier (*C. cinerascens*), never more than an occasional visitor. The marsh-harrier is abundant in many parts of North America.

Harriers. See ATHLETIC SPORTS.

Harrington, JAMES, author of the *Oceana*, a celebrated work, half romance, half treatise on political philosophy, written for the purpose of setting forth the best form of government for a commonwealth. The son of Sir S. Harrington of Exton, in Rutlandshire, he was born in January 1611, studied at Oxford under Chillingworth, and then spent some years on the Continent. In 1646, although a republican by conviction, Harrington was appointed one of the personal attendants of Charles I., and on the king's execution accompanied him to the scaffold. It was after this event that the *Oceana* was written; it was published in 1656. The salient points of the political doctrines therein expounded are these: the real basis of power is property, especially landed property; accordingly landed property should be distributed and held in such a way that no one person should derive from it more than a fixed amount of revenue; the rulers of the commonwealth should be changed every three years, their places being taken by others, elected by *ballot*. After the Restoration Harrington was arrested for alleged conspiracy, and during a severe imprisonment lost his reason. He died at Westminster, 11th September 1677. His writings, consisting, besides the *Oceana*, principally of essays, &c. in defence of his *magnum opus*, were first edited by Toland in 1700. The *Oceana* was reprinted by Henry Morley in 1887.

Harrington, SIR JOHN, born in 1561 at his father's seat of Kelston, near Bath, studied at Eton and Christ's College, Cambridge, and afterwards was attached to the court of Queen Elizabeth, who had been his god-mother. His wit brought him into much favour, which he endangered by the freedom and the political allusions of his satires. In 1599 he served under Essex in Ireland, and was knighted by him on the field, much to the queen's displeasure. To fortify his application to King James for the office of Chancellor-archbishop of Ireland he composed, in 1605, *A Short View of the State of Ireland*, a most interesting and singularly modern essay (first edited by Rev. W. Dunn Macray, 1880). He died of dropsy in December 1612. He is now remembered chiefly as the translator of Ariosto's *Orlando Furioso* (1591) into English verse. His other writings were some Rabelaisian pamphlets, a number of fair epigrams, and *A Brief View of the State of the Church*, written for the Prince of Wales.

Harris, in the Hebrides, comprises the southern portion of the island of Lewis and a number of adjacent islets. Pop. 4514. See LEWIS.

Harris, HOWEL, one of the fathers and founders of Welsh Calvinistic Methodism, was born in 1714 at Trevecca, in the county of Brecon. His mind was first seriously awakened to religious questions in 1735, and for seventeen years from that date he spent his time as a lay itinerant preacher, but confined his ministrations for the most part to Wales (see METHODISTS). After his retirement to Trevecca in 1752 he still continued to preach daily at his own home; and in order to accommodate those who came to hear him he built a large house, the inmates of which led a kind of monastic life. Harris died on 21st July 1773. See his *Autobiography* (1791) and W. Williams, *Welsh Calvinistic Methodism* (1872).

Harris, JAMES, a pre-scientific philologist, was born at Salisbury, July 20, 1709. His mother was a sister of the third Earl of Shaftesbury, author of the *Characteristics*. He had his education in his native city and at Wadham College, Oxford, whence he passed to the study of law at Lincoln's Inn. Finding himself at twenty-four on his father's death master of an ample fortune, he devoted himself to the assiduous study of the classics, but in 1761 he entered parliament, and later became Lord of the Admiralty, of the Treasury, and secretary and comptroller to Queen Charlotte. In 1744 he published a volume consisting of three treatises, on art, on music, painting, and poetry, and on happiness; and in 1751 his famous *Hermes*, an

interesting but scarce profitable inquiry into the philosophical basis of universal grammar. His incomplete *Philosophical Arrangements*, a study of the Aristotelian logic, was issued in 1775; and his *Philological Inquiries* on style and the true canons of literary criticism, in three parts—the last written in French (1780–89). He died in December 1780. Harris's works were collected, with a short life, by his son, the first Earl of Malmesbury (2 vols. 4to, 1801; 5 vols. 8vo, 1803).

Harris, JOEL CHANDLER, an American author, was born in Eatonton, Georgia, 8th December 1848, and was in turn printer, lawyer, and journalist. His delightfully original and unexpected book, *Uncle Remus, his Songs and his Sayings: the Folk-lore of the Old Plantation* (New York, 1880), quickly carried his name even to the Old World, at once to children and to scientific students of folklore. Later works are *Nights with Uncle Remus* (Boston, 1883), *Mingo and Other Sketches* (1883), and *Daddy Jake the Runaway, and Short Stories* (1889).

Harris, THOMAS LAKE, founder of the 'Brotherhood of the New Life,' was born at Fenny Stratford, in Buckinghamshire, 15th May 1823, accompanied his father to America, and had in turn been a Universalist pastor, and founded an 'Independent Christian Society,' when in 1850 he was drawn into the spiritualistic movement. He lectured in Great Britain in 1858, and on his return to America reorganised his society as the 'Brotherhood of the New Life.' Property was not held in common, and farming and industrial occupations were engaged in by his followers, numbering at one time about 2000 in America and Great Britain, amongst them Lady Oliphant and her son Laurence Oliphant. Harris was again in Europe in 1866. Latterly he settled in California. His community had no written creed or form of government. Harris acted as the inspired head of the brotherhood, his system combining the doctrines of Swedenborg and of Fourier, while maintaining the authority of the Scriptures and the sacredness of the marriage tie. He also taught that God is two-in-one, infinite in fatherhood and motherhood, and that all who become angels find their counterpart in sex, and are two-in-one to all eternity. Harris has published many works in prose and poetry, amongst which are *Wisdom of Angels* (1856); *Arcana of Christianity* (1857); *Modern Spiritualism* (1860), &c. The influence of the teaching of Harris may be traced in Laurence Oliphant's *Sympneumata* (1885) and his *Scientific Religion* (1888); as also in Pulsford's *Margaroth* (1881). See William Oxley's *Modern Messiahs and Wonder-workers* (1889).

Harrisburg, the capital of Pennsylvania, is situated in the midst of beautiful scenery on the left bank of the Susquehanna River, which is here crossed by several long bridges, 106 miles W. by N. of Philadelphia. It contains the capitol, a court-house, the state arsenal, the state insane asylum, and a Roman Catholic cathedral and some forty other churches. The state library has some 60,000 volumes. The city has a number of blast-furnaces and rolling-mills, and large manufactures of steel and iron, including boilers, machinery, nails, and files; cotton goods, flour, bricks, shoes, brooms, &c. are also produced, and there is a large trade in lumber. Founded in 1785, Harrisburg became the state capital in 1812. Pop. (1870) 23,104; (1880) 30,762; (1890) 39,385.

Harrison, a town of New Jersey, on the Passaic, opposite Newark, with which it is connected by a bridge. It has manufactures of oil-cloth and enamelled cloth, wire, thread, &c. Pop. (1880) 6898; (1890) 8338.

Harrison, BENJAMIN, twenty-third president of the United States, was born at North Bend, Hamilton county, Ohio, August 20, 1833. His father, the third son of President William Henry Harrison, was a small farmer, who, however, managed to educate his nine children; and Harrison, after two years at a school called Farmer's College, near Cincinnati, was transferred to Miami University, at Oxford, Ohio, where he graduated in 1852. In 1854 he settled as a lawyer in Indianapolis, where his first earnings were as a crier of the Federal court. In a short time he was in full practice in all the courts. In 1860 he became candidate for supreme court reporter of Indiana, by nomination of the Republican party, and was elected. Entering the Union army pending the term, the office was declared vacant. In 1864 his party re-elected him with a largely increased majority. He remained in military service, however, and only resumed the reportership upon muster-out at the end of the war. He began his military career in 1862 by raising a company, in which his first commission was of second-lieutenant. He was then made colonel of the 70th Regiment Indiana Volunteers, and ordered to Kentucky. Carrying his studious habits into camp, he became a proficient drill-master. As colonel, sometimes brigade-commander, in the first division 11th Army Corps, he participated in Sherman's Atlanta campaign, distinguishing himself in the battles of Resaca and Peach Tree Creek, and he was in 1865 commissioned brevet-brigadier-general. He also took part in the battle of Nashville, under Thomas, in December 1864.

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Returning to the law in Indiana, Harrison declined a third nomination as supreme court reporter. He took an active part in the Grant campaigns of 1868 and 1872, and was nominated for the governorship of the state in 1876; but, though he polled 2000 votes more than the rest of his party, he was defeated. Two years later he presided over the State Convention, and in 1880 he appeared in the Chicago National Convention as chairman of his state delegation. He then declined the use of his name for the presidential nomination; and he afterwards also declined a seat in the cabinet of President Garfield. In 1884 he was again delegate-at-large, and was discussed as a possible nominee for the presidency. In 1880 he was elected United States senator from Indiana; but at the end of his term of six years he was defeated for re-election, and returned to his law office. At the National Republican Convention (1888) in Chicago Harrison received the presidential nomination; President Cleveland being the Democratic nominee. Harrison's election signified the triumph of protection; but in 1892 he was defeated by Mr Cleveland. He was chief counsel for Venezuela in the boundary dispute with British Guiana. See the Life by Lew Wallace (1888), and UNITED STATES, p. 389.

Harrison, FREDERIC, was born in London, October 18, 1831, and was educated at King's College School, London, and Wadham College, Oxford, taking a classical first-class in 1853. He became Fellow and tutor of his college, but was called to the bar in 1858, and thereafter practised conveyancing and in the Courts of Equity. He sat on the Royal Commission upon Trades-unions (1867–69), served as secretary to that for the Digest of the Law (1869–70), and from 1877 till 1889 was professor of Jurisprudence and International Law at Lincoln's Inn Hall. A Positivist in religion and an advanced Liberal in politics, he has argued his opinions in many vigorous and well-written articles in the magazines and reviews, some of which have been reprinted separately. Of his works the chief

are *The Meaning of History* (1862), *Order and Progress* (1875), *Lectures on Education* (1883), *On the Choice of Books* (1886), *Oliver Cromwell* (1888), *The Meaning of History* (1894), *Literary Essays* (1895), *Tennyson, Ruskin, Mill*, &c. (1900). He contested London University in 1886 as a Home-rule candidate, but without success. In 1889–93 he was an alderman in the London County Council.

Harrison, JOHN, the inventor of the chronometer for determining longitude at sea, was born at Foulby, near Pontefract, Yorkshire, in 1693. His mechanical genius, which showed itself at an early age, led him to study the construction of clocks and watches, with a view to diminish as much as possible their errors and irregularities, and by 1726 he had constructed a timekeeper provided with compensating apparatus for correcting errors due to variations of climate. In 1714 the government had offered prizes of £10,000, £15,000, and £20,000 for the discovery of a method for determining the longitude within 60, 40, and 30 miles respectively. After a long period of persevering labour Harrison made a chronometer which, in a voyage to Jamaica in 1761–62, was found to determine the longitude within 18 miles. After another voyage to Jamaica, and further trials, he was awarded the prize of £20,000 in 1765 and 1767. The success of Harrison's chronometer is owing to the application of the compensation curb to the balance wheel; and on the same principle he invented the gridiron pendulum for clocks. Besides these, he invented the going fusee and the remontoir escapement (see HOROLOGY). Harrison died in London, 24th March 1776. He wrote *Description of such Mechanism as will afford a Nice or True Measurement of Times.* See *The Principles of Mr Harrison's Timekeeper* (1767).

Harrison, THOMAS, regicide, was born at Newcastle-under-Lyme in 1606, and joined the parliamentary army at the opening of the Civil War. He commanded the guard that carried the king from Hurst Castle to London, sat among his judges, and signed his death-warrant. He did good service at Worcester, but was too uncompromising alike in religion and politics to favour Cromwell's tolerant ideas, and was accordingly deprived of his commission, and later imprisoned for his share in some of the plots hatched by the more irreconcilable bigots. With characteristically stubborn heroism he would not fly at the Restoration, and was soon seized, tried, and condemned to death. He died bravely, October 13, 1660, with the words on his lips, 'If I had ten thousand lives, I could freely and cheerfully lay them all down to witness to this matter.'

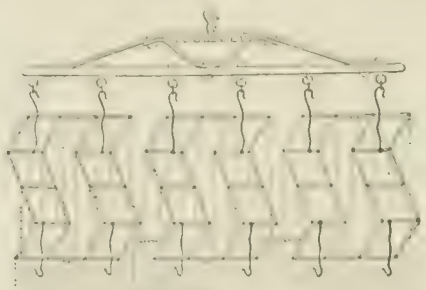
Harrison, WILLIAM, the chief of Holinshed's coadjutors, was born in London, educated at St Paul's and Westminster, and studied first at Oxford, next at Cambridge, graduating B.D. at the latter in 1569. He became household chaplain to William Brooke, Lord Cobham, who presented him to the rectory of Radwinter, in Essex, which he held all his life, together for ten years with the vicarage of Wimbish in the same county. In 1586 he was installed canon of Windsor, and died in 1593. Almost all we know of him he has told us himself, even to his gardening and his brewing; and he impresses his readers throughout as a learned, honest, and singularly open-eyed although untravelled man. When he wrote the book by which his name is remembered one Trinity term in London, he was more than forty miles from his books, and he tells us further that till recently, except in visits to the universities or to Lord Cobham's house in Kent, he had never gone a forty miles' journey in his life. But at that time he had the advantage of access to the valuable manuscripts of Leland. The fruit of his application was his famous *Description of England*, as well as his *Description of Britain*, written for Holinshed's *Chronicle*. In the 'Epistle Dedicatorie' he tells us he had an 'especial eye unto the truth of things;' and further that he was 'the first that hath taken upon him so particularly to describe this Ile of Britain.' The former is especially interesting to us as a vigorous and elaborate account of the conditions of life in the England of Shakespeare's day, treating in succession, with some fullness of detail, subjects so diverse as the church, the bishoprics, the universities, the navy, the food, apparel, armour, the beggars and rogues, laws, punishments, buildings, cities, parks, gardens, fairs, and markets. The second and third books of the *Description of England* were edited by Dr Furnivall, for the New Shakespeare Society (parts i.–iii. 1877–81). The whole work is of course reprinted in all editions of Holinshed.

Harrison, WILLIAM HENRY, ninth president of the United States, was born in Charles City county, Virginia, 9th February 1773. His father, Benjamin Harrison (1740–91), was one of the signers of the declaration of independence, which, as chairman of committee, he reported to congress on 4th July 1776. There is a popular legend, seemingly unfounded, that makes the family descended from Harrison the regicide. After his father's death, William joined the army which Wayne was leading against the North-western Indians, and showed great gallantry at the battle on the Miami (1794). He left the army in 1798. He represented the North-west Territory as a delegate in congress in 1799–1800, and succeeded in passing a valuable law relating to the sale of the federal land in small parcels; and when Indiana Territory was formed (1800), including the present states of Indiana, Illinois, Michigan, and Wisconsin, besides parts of Minnesota and Ohio, he was appointed its governor. He laboured courageously to avert war with the Indians, but was compelled to quell Tecumseh's outbreak, and beat off a fierce and treacherous attack, ending in an important battle at Tippecanoe (7th November 1811). In the war of 1812–14 he was appointed to the chief command in the north-west, repulsed the British force under Proctor, and by the victory of Perry on Lake Erie was enabled to pursue the invaders into Canada, where, on 5th October 1813, he totally routed them in the battle of the Thames. In 1814 he resigned his commission. In 1816 he was elected to congress, and in 1824 became a United States senator. In 1828 he went as ambassador to Colombia, but was recalled in 1829, and for twelve years was clerk of a county court in Ohio. He received 73 electoral votes for the presidency of the United States in 1836 against Van Buren's 170; but four years later, the Whig party having united, he defeated Van Buren, obtaining 234 electoral votes to the latter's 60. The contest is noteworthy as having witnessed the introduction of the enormous mass-meetings and processions, the emblems and banners, that have since been part of every presidential campaign. Harrison died a month after his inauguration, on 4th April 1841, and was succeeded in office by the vice-president, John Tyler.

Harrogate, or HARROWGATE, a watering-place in the West Riding of Yorkshire, lies among the moors, 450 feet above sea-level, and by rail is 17 miles N. of Leeds and 20 WNW. of York. It consists of two parts, High and Low, and is celebrated for its sulphureous, saline, and chalybeate springs. The sulphureous springs are of laxative and diuretic quality, while the chalybeate are tonic. The waters are used both externally and internally, and are in great repute

in many diseases of the skin and in some cases of dyspeptic disorders, scrofula, gout, jaundice, rheumatism, &c. The springs were discovered in 1596. Harrogate is a remarkably healthy place, the death-rate per 1000 ranging in six years between 14·5 and 11·7. It was incorporated as a municipal borough in 1883. Smollett's *Humphrey Clinker* (1771) gives a lively account of Harrogate. Pop. (1851) 3678; (1881) 9482; (1891) 13,917. See Grainge's *History of Harrogate* (1871).

Harrow, an agricultural implement used for smoothing and pulverising ploughed land, and for covering the seeds previously sown. It consists of a frame of a square or rhombic form, in which are fixed rows of teeth, or *tines*, projecting downwards. The harrow is a very ancient implement, having been in use beyond the dawn of history; but as in early times only the lighter soils were cultivated, it often consisted of bushes, or branches of trees, which merely scratched the ground. Subsequently, we find a wooden frame and wooden tines in use; next, the wooden frame with iron tines, a form of the instrument still in use in many parts, especially upon light soils. The harrow constructed wholly of iron is now most largely employed, and as it can be made light or heavy, works more cleanly, and is more durable, it is preferable to the old wooden form. Iron harrows are usually made in zigzag form as shown below. The Howard harrow has the tines so arranged that no one follows in the track of another, but each has a separate line of action which greatly diminishes the risk of any



Howard's Harrow.

portion of the surface escaping pulverisation. Exceptionally strong harrows with rank teeth are made for breaking down rough or hard land. The 'chain-harrow,' which is a congeries of iron rings, is useful for covering grass-seeds, and especially for separating weeds from the earth or clods in which they are enveloped. Drill harrows are constructed to scarify the soil between raised drills and also the raised drills themselves.

Harrow, or HARROW-ON-THE-HILL, a town of Middlesex, 11½ miles WNW. of St Paul's, stands on a hill, 200 feet high, that looks over thirteen shires. Its 'visible church,' which crowns the hill-top, was founded by Lanfranc, and rebuilt about the middle of the 14th century. Exhibiting every style of Gothic architecture, from Norman to Perpendicular, it has a lofty spire and eleven brasses (one of them to John Lyon); whilst in the churchyard is a flat tombstone on which Byron as a schoolboy used to lie. Pop. (1881) 5558; (1891) 5725. The district has increased even more rapidly (from 12,796 to 15,710), owing largely to building operations and to the railway improvements.

HARROW SCHOOL was founded in 1571 by John Lyon, a wealthy yeoman of Preston, in the parish of Harrow-on-the-Hill, who died in 1592; but the original red-brick school-house (now the name-becarved Fourth Form School) was not built till 1608–15. New buildings have been added since 1819—the chief of these being the Second-pointed chapel (1857), with its tall slender spire and memorial glass to twenty-two Crimean officers; the Vaughan Memorial Library (1863), similarly designed by Sir G. G. Scott; and the semi-circular Speech-room (1877). The school was primarily intended to afford a free education to thirty poor boys of the parish; but the statutes, drawn up by the founder two years before his death, provided also for the admission of 'so many foreigners as the place can conveniently contain;' and it is to that provision that Harrow, although not richly endowed, owes its proud position among the great schools of England. Still, its fortunes have fluctuated much, the number of boys being 144 in 1721, 50 in 1745, 345 in 1803, 80 in 1845, 438 in 1859, and now upwards of 500. The study of mathematics was first introduced in 1837, of modern languages in 1851–55; and all the other branches of a modern education have followed. Music became a specialty of Harrow education under Mr J. Farmer, who was music master here from 1862 till 1885. Archery, which flourished till 1776, has been superseded by cricket, football, rackets, &c., the Eton and Harrow cricket-match at Lord's dating from 1818. The age of admission is twelve to fourteen; and there are six or seven entrance scholarships, of from £30 to £80 per annum, offered every Easter. Of leaving scholarships, the most valuable are Baring's three of £100 a year for five years to Hertford College, Oxford. Under the Public Schools Act of 1868 the governing body comprises six members, elected respectively by the Lord Chancellor, the universities of Oxford, Cambridge, and London, the Royal Society, and the under-masters. Among the twenty-one head-masters have been Archdeacon Thackeray (1746–60), Dr Sumner (1760–71), Dean George Butler (1805–29), Archbishop Longley (1829–36), Bishop Christopher Wordsworth (1836–44), Dean Vaughan (1844–59), Dr Henry Montagu Butler (1859–85), and the Rev. J. E. C. Welldon. Of illustrious Harrovians may be mentioned Lord Aberdeen, Bruce the Abyssinian, Charles Buller, Colonel Burnaby, Lord Byron, Charles Stuart Calverley, the Marquis of Dalhousie, Lord Dalling, Lord Goderich, the Marquis of Hastings, Lord Herbert of Lea, Theodore Hook, Sir William Jones, Cardinal Manning, Hermann Merivale, Dean Merivale, Lord Palmerston, Dr Samuel Parr (a native also, and an under-master), Sir Robert Peel, Spencer Perceval, Admiral Rodney, Lord Shaftesbury, Sheridan, J. S. Symonds, Archbishop Trench, Anthony Trollope, and Sir George Trevelyan. 'Stet fortuna domus.'

See R. Pitcairn, *Harrow School* (1870); P. M. Thornton, *Harrow School and its Surroundings* (1885); Bushell, *Early Harrow Charters* (1893); R. C. Welch, *Harrow School Register, 1801–85* (1894); Howson & Warner, *Harrow School* (1898).

Harry, BLIND, a Scottish minstrel of the 15th century. Scarcely anything is known of his life beyond what is told by John Major (or Mair) in his *History of Scotland*, published in 1521. 'When I was a child,' he says, 'Henry, a man blind from his birth, who lived by telling tales before princes and peers, wrote a whole book of William Wallace, weaving the common stories (which I, for one, only partly believe) into vernacular poetry, in which he was skilled.' In 1490–92 Blind Harry is found at the court of King James IV., receiving occasional gratuities of five, nine, and eighteen shillings. The poem attributed to him, *The Life of that Noble Champion of Scotland, Sir William Wallace, Knight*, was completed before the end of the year 1488, when it was copied by John Ramsay. This copy, the oldest MS. of the work now known to

exist, does not ascribe it to Blind Harry, nor is his name given to it in the earlier printed editions. The poem, which contains 11,861 lines, of ten syllables each, is written in rhyming couplets. The language is frequently obscure, and sometimes unintelligible, but the work as a whole is written with vigour; in some passages it kindles into poetry; and it is altogether a surprising performance, if we regard it as the composition of one who was born blind. The author seems to have been familiar with the metrical romances which were the popular literature of the time, and, though his poem has no claim to be regarded as history, he makes frequent references to original authorities which form the main groundwork of the narrative. He represents himself as deeply indebted to the life of the great Scottish patriot, written in Latin by his schoolfellow Master John Blair, the chaplain of Wallace, and to another by Sir Thomas Gray, the parson of Liberton. The poem was at one time regarded as wholly a work of fiction, but authentic documents recently brought to light have shown that though it contains a great number of mistakes or misrepresentations of well-known facts, it is on the whole a valuable and in not a few incidents a trustworthy narrative. The work is believed to have been printed in the Scottish capital as early as 1520, but no perfect copy is known to be preserved of any earlier edition than that of Edinburgh in 1570, bearing the title of *The Actis and Deidis of the Maist Illuster and Vailyeand Campioun Schir William Wallace, Knicht of Ellerslie*. The work was reprinted at Edinburgh in 1594, 1601, 1620, 1648, 1673, and 1758; at Glasgow, in 1665 and 1699; also at Aberdeen and at Perth. Good editions are that by Jamieson (Edinburgh, 1820, 4to) and that by Moir for the Scottish Text Society (1885–89). The work was for about 200 years one of the most popular in Scotland, but gradually fell into neglect as its language, never very plain, ceased to be understood except by scholars. Its place was supplied by a modernised version by William Hamilton of Gilbertfield, published at Glasgow in 1722, with the title of *A New Edition of the Life and Heroic Actions of the Renoun'd Sir William Wallace*. This is a poor performance, but it continued to be widely circulated among the Scottish people almost to our own day.

Hart, the name given to the stag or male deer, from the age of six years, when the crown or surroyal antler begins to appear.

Hart, Solomon Alexander, painter, was born at Plymouth, in April 1806, the son of a Jewish goldsmith, who in 1820 removed to London. Apprenticed first to a line engraver, in 1823 young Hart became a student at the Royal Academy. Amongst his works are 'The Elevation of the Law' (1830), 'Isaac of York' (1830), 'English Nobility receiving the Communion' (1831), 'Henry I. receiving Intelligence of the Death of his Son' (1840), 'Milton visiting Galileo in Prison' (1847), 'The Three Inventors of Printing' (1852), &c. He also painted miniatures and portraits. In 1840 Hart became R.A., in 1854 professor of Painting, and in 1865 librarian of the Royal Academy. He died in London, 11th June 1881.

Harte, Francis Bret, was born in Albany, New York, August 25, 1839. His father, a teacher in the Female Seminary, died early, and the boy received only a common school education. He went to California with his mother in 1854, and opened a school at Sonora; but he was not successful in this, nor in mining, which he tried afterwards. He next became a compositor, and in 1857 obtained employment in the office of the *Golden Era*, in San Francisco. His experiences among miners and the rough population that were attracted by the 'gold-craze' had made a powerful impression upon his mind, and his first literary efforts were sketches of the people and the scenes he had observed. These sketches attracted much attention, and as a result the author became one of the staff of the paper. His *Condensed Novels* afterwards appeared in another weekly, the *Californian*. He was secretary of the United States Mint in San Francisco from 1864 to 1870, and during this period wrote some of his most famous poems, among them 'John Burns of Gettysburg,' 'The Society upon the Stanislau,' &c. He founded in 1868 and edited the *Overland Monthly*, to which he contributed *The Luck of Roaring Camp*, *The Outcasts of Poker Flat*, *Miggles*, *Tennessee's Partner*, *The Idyl of Red Gulch*, and *Plain Language from Truthful James* ('The Heathen Chinee'). Returning to the East, he became a contributor to the *Atlantic Monthly*, and from time to time delivered lectures in various cities upon the pioneers of California. In 1878 he received the appointment of United States consul at Crefeld. After two years he was transferred to Glasgow, and held that post until 1885. Since that time he has resided in London, and devoted himself to literary pursuits.

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Bret Harte has been a prolific writer, and almost everything from his pen bears the stamp of his original genius. This, however, is truer of the early and middle period than of the later. Generally, he is strongest in the field of which he was the discoverer; although in some instances—notably in *Thankful Blossom*—he has produced exquisite romances, sometimes with a pastoral flavour, wholly unlike the turbulence of the first efforts.

The mixture of southern and western people in the early rush to the goldfields seems to have produced a new dialect, but it probably had a brief existence. At least, it would be wrong to suppose that the peculiar phrases in the mining sketches (so picturesque and shocking at once) are part of the daily talk of the people to-day. But the dialect was not all. Harte has described or invented new types of character, and has portrayed them and their surroundings with a vivid energy that has no modern counterpart. It is difficult to say whether he has been more successful in poetry or in prose; for the same virile power appears in both, and he has evidently by nature a strong sense of melody and great facility in verse. In 'John Burns of Gettysburg' and 'Dickens in Camp' there is evidence that he might have taken a higher place among poets if he had devoted himself to serious work. But his instinct has been his guide, and has led him in the path of fame. It must be remembered that he acquired the art of effective writing by practice, without previous discipline, and that for him there was no model. Since he has shown the way, not a few have followed him—afar.

His *Complete Works*, collected and revised by himself, appeared in London in 5 vols. in 1881. Since then his publications have included *Flip* (1882); *In the Carquinez Woods* (1883); *By Shore and Sedge* (1885); *Snowbound at Eagle's* (1886); *A Phyllis of the Sierras* and *A Drift from Redwood Camp* (1888); *Cressy* (1889); *The Heritage of Dedlow Marsh* (1889); *A Waif of the Plains* (1890); *A Ward of the Golden Gate* (1890); *A Sappho of Green Springs* (1892); *Sally Dows* (1892); *Susy* (1893); *The Bell-Ringer of Angel's* (1894); and *Clarence* (1895).

Hartebeest. See Antelope.

Hartford, the capital of Connecticut, is situated on the right bank of the Connecticut River, 50 miles from its mouth, and 112 by rail NE. of New York, with which it is also in daily communication by steamboat. It is a handsome city, with streets not all too regular, and many tasteful private houses. It has an imposing state capitol of white

marble, a state arsenal, a new post-office and United States court house; and on the outskirts are the new buildings of Trinity College (Episcopal), which was founded on the present site of the capitol in 1823 (see GLENALMOND). To the notable public buildings, besides the Wadsworth Athenæum and the high school, must be added the substantial offices of the many great insurance companies whose headquarters are established here, as well as a number of banks. Hartford contains a Congregational theological seminary, a large hospital, asylums for orphans, the deaf and dumb, and the insane, and possesses several important libraries; it is the seat of a Roman Catholic bishop also, and has two nunneries. There are extensive manufactures of Colt's pistols, Gatling guns, engines, boilers, and machines, hardware and other metal goods, stoneware, and wooden wares. There is also some publishing, and a very considerable trade in Connecticut tobacco. The site of a Dutch fort in 1633, and of a colony of Massachusetts settlers as early as 1635–36, Hartford was incorporated as a city in 1784, and has been sole capital of the state since 1873. It was the seat of the Hartford Convention (q.v.). See also CONNECTICUT. In point of population the city stands second to New Haven, which formerly shared with Hartford the rank of semi-capital. Pop. (1870) 37,180; (1880) 42,015; (1890) 53,230. See *The River Towns of Connecticut*, by C. M. Andrews (Johns Hopkins University Studies, 1889).

HARTFORD CONVENTION, in the political history of the United States, was an assemblage of delegates from the New England States, at Hartford, Connecticut, December 15, 1814. This convention was proposed by the Massachusetts legislature. The war with Great Britain in 1812–14 had been from the first opposed by the majority of the people of New England, who were Federalists, and looked upon the war as a mere party measure of the Democrats; and in face of the destruction of the commerce and the fisheries, the chief interests of New England, this convention was called with the ostensible object of devising means of security and defence. It sat twenty days with closed doors, and, as it was supposed to be of a treasonable character, it was watched by a military officer of the government. The convention prepared a report recommending the adoption of measures by the state legislatures that would protect their citizens from conscriptions and impressments, and the militia from forcible drafts; the report also proposed certain amendments to the federal constitution. No treasonable act was committed, and no treasonable intention proved; yet the suspicion of disloyal tendencies clung to the convention, and completed the ruin of the Federalist party, which did not survive the election of 1816. Some ground for the public suspicion was probably afforded by the fact that a section of the Federalist leaders known as the 'Essex Junto,' who had in 1804 and 1809 seriously discussed the question of dissolving the Union and forming an Eastern confederacy, were foremost in bringing the convention about; and the charge of aiming at a kingdom of New England would therefore make no serious demand upon the credulity of partisan opponents. Yet the convention included men of the highest public character, who strenuously defended the pure purpose of its patriotism, and the charges of treasonable designs are now nearly universally regarded as baseless.

Hartington, LORD. See CAVENDISH.

Hartlepool, a municipal borough and seaport in the county of Durham, is situated on a small peninsula north of the estuary of the Tees, 12 miles NNE. of Stockton, and 18 ESE. of Durham. It formerly attracted many visitors for sea-bathing during the summer months; but, owing to the formation of railways connecting it with the Durham coal-mines, it is no longer visited for that purpose. Its ancient sea-fishing industry is retained, and has recently extended in consequence of the demand from Yorkshire. It is the only borough in the county founded by royal charter whose charter is extant. In the 13th century Hartlepool belonged to the Bruces of Annandale in Scotland, progenitors of the royal family of that name. After Bruce ascended the Scottish throne his English possessions were forfeited, and Hartlepool was granted to the Cliffords. The boundaries of the ancient borough were in 1883 extended so as to include the township of Throston and part of the township of Stranton, making the southern boundary conterminous with the modern borough of West Hartlepool. The local industries of Hartlepool are iron shipbuilding, marine engineering, and cement-manufacture. Formerly there was a considerable shipping trade, but that is now almost entirely transferred to West Hartlepool, where the chief custom-house and other facilities are situated. The harbour entrance is safe, and communicates by a channel direct to the more modern port. The public institutions include excellent public schools, a public hospital, an ancient parish church, and thirteen other places of worship. A substantial sea-wall and delightful promenade, completed in 1889, have added much to the attractive appearance of the town on the seaward side. Pop. of municipal borough (1851) 9503; (1871) 13,166; (1881) 16,998; (1891) 21,521.

WEST HARTLEPOOL, a modern municipal borough and seaport, is situated to the south as Hartlepool is to the north of Hartlepool Bay, and practically forms one town with Hartlepool. It was founded in 1847 by Ralph Ward Jackson, an enterprising railway speculator, afterwards M.P. for the Hartlepools. It possesses a theatre, athenæum, and mechanics' institute, custom-house, market-house, exchange, a municipal hall opened by Prince Albert Victor in 1889, a school of art, and other public buildings. The first harbour was constructed here in 1847, of 12 acres, and has since been greatly enlarged. The dock area of Hartlepool and West Hartlepool together, including the timber and shipbuilding yards, &c., is over 300 acres in extent. Extensive iron shipbuilding-yards, cement-works, wood-pulp works, and marine engine-building establishments have been founded. There are graving-docks leased by the North-Eastern Railway Company, and also one extensive graving-dock open to public use. Besides coal, the following are the principal imports: Flax and hemp, grain, timber, butter, cheese, fruit, cattle, tallow, yeast, iron, zinc, &c. The exports consist of woollen and cotton goods, copper, cement, drugs, machinery, earthenware, yarn, hides, &c.; the trade being carried on for the most part with the Baltic ports, Cronstadt, St Petersburg, and Danzig, and with Hamburg and Rotterdam. The export of coal from the united port is about 1,500,000 tons annually. Governed from 1854 by a local commission, the town was created a municipal borough in 1887. Pop. of municipal district (1861) 12,603; (1881) 28,167; of municipal borough (1891) 42,492. In 1867 'The Hartlepools' were constituted a parliamentary borough, returning one member. Pop. 46,990. See Sir C. Sharpe's *History of Hartlepool* (1816; new ed. 1851).

Hartley, DAVID, philosopher, was born August 30, 1705. His father was vicar of Armley, in Yorkshire. At fifteen he entered Jesus College, Cambridge, and became a Fellow of the college. He studied at first for the church, but, dissenting from some points in the Thirty-nine Articles, he abandoned his original intention. In his mature years

he impugned the eternity of hell-punishment, maintaining the ultimate restoration of the lost; in all other points his published opinions coincided with the Church of England, and he continued to the last a member of the church. He finally chose the profession of medicine, in which he attained considerable eminence. He practised as a physician successively at Newark, Bury St Edmunds, in London, and at Bath, where he died on the 25th of August 1757, at the age of fifty-two.

His work on the mind, entitled *Observations on Man* (1749), on which his fame rests, was begun when he was about twenty-five, and occupied his thoughts for sixteen years. The first part relates to the constitution of the human mind; the second treats of religion and morals. His handling of the mind turns throughout upon two theories or hypotheses, which have very different merits. The first is called the Doctrine of Vibrations, or a theory of nervous action analogous to the propagation of sound, the suggestion of which he owed to Newton, of whose writings he was a devoted student. His second and most valuable innovation consisted in showing that the faculties, powers, and feelings of the mind might be explained to a very wide extent by the principle of the Association of Ideas (q.v.); and it should be said that he was certainly the first to do justice to the applications of that principle to explain the phenomena of the mind.

The doctrine of vibrations supposed that when any one of the senses is affected by an outward object the effect was to set the particles of the nerve in a vibratory motion, which ran along to the brain, and produced corresponding vibrations in the cerebral substance. In like manner, when an active impulse proceeded outwards to the muscles the manner of communication along the nerves was of the same kind. He even extended these molecular vibrations to the other tissues. The dislike generally entertained towards this part of Hartley's speculations arose from a mistaken notion of its involving or favouring materialism. See G. S. Bower, *Hartley and James Mill* (1881).

Hartlib, SAMUEL, was born about 1600 at Elbing, in Prussia, son of a Polish refugee and an English mother. Coming to England about 1628, he busied himself in trade, later in agriculture, and, when he had exhausted his fortune in his experiments, projected a school to be conducted on new principles. It is highly probable that his idea inspired his friend Milton's famous *Tractate on Education*, addressed to Hartlib in 1644, as well as Sir William Petty's *Two Letters* (1647 and 1648). He was granted by Cromwell a pension of £100, increased later to £300, which after the Restoration he petitioned parliament to renew. No letters of Hartlib's are extant posterior to 1662. He wrote on education and on husbandry. See *Biographical Memoir of Samuel Hartlib* by H. Dircks (1865).

Hartmann, KARL ROBERT EDUARD VON, German philosopher, born at Berlin on 23d February 1842. From 1858 to 1865 he served as an artillery officer in the Prussian guards, but was compelled to abandon his calling owing to an affection of the knee. Since 1867 he has lived in Berlin, busied with the elaboration of a comprehensive system of philosophy. His activity may be divided into two periods; in the first, from 1868 to 1877, he was chiefly working out his ideas on methodology, the philosophy of the natural sciences, psychology, metaphysics, and the theory of knowledge (*Erkenntnisstheorie*); in the latter, from 1878 onwards, he has been chiefly concerned with ethics, the philosophy of religion, and æsthetics. His system is a synthesis of Hegel's and Schopenhauer's systems, which he has reduced, by means of Schelling's conception of the Unconscious and his doctrine of principles, to a concrete monism; and his substructure is built upon an empirical basis with the aid of the inductive methods employed in the natural sciences and history. In his own words—'As I have followed Schelling's precedent in uniting Hegel's one-sided identification of the world's substance with the logical Idea with Schopenhauer's similarly one-sided identification of it with Will, so I have also endeavoured to effect a higher unity between Hegel's coldness and want of feeling, whereby the individual is degraded to an insensitive instrument of the Idea, with whose fate, with whose weal or woe, philosophy does not concern itself, and Schopenhauer's lack of interest in the process of the All, and his insistence on the redemption of self from an individual existence of pain as the sole end of life. In a similar manner I have corrected Hegel's idea of the philosophy of religion. He has endeavoured to interpret Christianity in a false and unhistorical manner, in that speculatively he makes it the absolute religion of the intellect (*Geist*). This faulty conception I have amended with certain elements of thought derived from Schopenhauer, to wit, a recognition of the deep and peculiar significance of the Indian religions, of which Hegel had no comprehension and with which he had consequently no sympathy. In my ethics I have assigned to Schopenhauer's emotion morality its proper place beside Hegel's intellectual morality, and have linked Hegel's demand for the subordination of the individual to the teleological end of the absolute Idea to Schopenhauer's conception that the ethical subordination of the individual is conditioned by the unity of substance which obtains between all separate individualities and the one world-substance. But in all these departments of thinking the richer and more important factors were contributed by Hegel's philosophy, whilst Schopenhauer's less elaborated system furnished me with complementary elements. In æsthetics the only thing I had to do in principle was to emphasise still more sharply than Hegel himself has done the antithesis between his concrete idealism and the abstract idealism of Schelling and of Schopenhauer.'

The great aim Ed. von Hartmann has set before himself is that of harmonising and reconciling philosophy with science, by gathering up the varied results of modern scientific investigation into an all-comprehensive philosophic conception of the world (*Weltanschauung*). His speculative system is commonly believed to be pessimistic in temper; but that is not the case. The Unconscious (the universal monistic principle) is both real and ideal, both will and presentation—the substantial and intelligent principles respectively. And the world-process, instead of being negative, is a process of evolutionary optimism. The substantial principle involves intrinsically an excess of pain over pleasure in the world; and this excess of pain can only be abolished by the annihilation of the substantial principle, Will, and its specific energy, willing, not, however, in individual beings, but once for all universally. The agency by which this 'best possible' consummation is to be achieved is the intellectual principle, working through its own creations, consciousness and individuality, along the lines of progressional development. And this strikes the keynote of the philosophic temper in which Von Hartmann writes. He is an ardent champion of evolutionary progress, a believer in the mission of western energy and enlightenment, and in its teleological justification, an admirer of the modern spirit of enterprise, its robust vigour, its keen delight in struggle and conflict, and its restless practical activity. Hence he proclaims himself as opposed to the teaching and attitude of the prophets of the *Weltschmerz;* hence he condemns the temper of oriental passivity, the unmanly fashion of

cowering and shivering before the March blasts of misery, and despises that 'weariness ere eventide' which is now become so common amongst us.

Ed. von Hartmann also gives close attention to the public questions of the day in Germany, and writes ably and clearly on such matters as education, politics, &c. The results of his activity in these departments will be found in *Zur Reform des höheren Schulwesens* (1875), *Die politischen Aufgaben und Zustände des Deutschen Reichs* (1881), *Moderne Probleme* (1885), *Gesammelte Studien und Aufsätze* (1876) this last containing an autobiography and *Zwei Jahrzehnte Deutscher Politik* (1889), besides numerous contributions to magazines, such as *Die Gegenwart*, &c.

The books in which his philosophical creed is laid down bear the following titles: *Philosophie des Unbewussten* (1869; 10th ed. 1890; Eng. trans. by Coupland, 1884); *Phänomenologie des sittlichen Bewusstseins* (1878; 2d ed. 1886); *Das religiöse Bewusstsein der Menschheit im Stufengang seiner Entwickelung* (1882); *Die Religion des Geistes* (1882); *Die Deutsche Aesthetik seit Kant* (1886); and *Die Philosophie des Schönen* (1887). Besides these, he has written several books supplementary to his principal lines of thought, such as *Kritische Grundlegung des transscendentalen Realismus* (3d ed. 1885); *Neukantianismus, Schopenhauerianismus, und Hegelianismus* (2d ed. 1878); *Die Selbstzersetzung des Christentums und die Religion der Zukunft* (2d ed. 1874; Eng. trans. by Dore, 1885); a work on the theory of knowledge (1889); *Kritische Wanderungen durch die Philosophie der Gegenwart* (1890), &c. Useful helps to the study of his system are Koeber's excellent condensation, *Das philosophische System H. von Hartmanns* (1884), and Plumacher's *Der Pessimismus in Vergangenheit und Gegenwart* (1884).

Hartmann von Aue ranks next after Wolfram von Eschenbach and Gottfried von Strasburg as a poet of the Middle High German period. He was born about 1170, of a noble Swabian family, took part in the Crusade of 1187, and died between 1210 and 1220. His writings consist of narrative poems and songs. The most popular of the former is *Der arme Heinrich*, based upon a Swabian traditionary story. *Erec*, which relates the legend reproduced in Tennyson's 'Enid' in *Idylls of the King*, and *Iwein*, are both drawn from the Arthurian cycle, and closely follow French poems by Chrestien de Troyes. In *Gregor vom Stein*, the plot of which is of a repulsive nature, Hartmann depicts worldly passion subdued and purified by the power of religious faith, the faith of the ascetic of the church at that date. The songs belong to the erotic class and are marked by freshness and naïveté. His longer works have each been edited several times separately. F. Bech published a critical edition of Hartmann's collected writings in 1866-69 (2d ed. 1870–73).

Hartshorn, the term given in pharmacy to the antlers of the Red Deer or *Cervus elaphus*. Its composition is very different from that of persistent horns, as those of the ox, for example, and is identical, or nearly so, with that of bone. The products of its distillation, containing among other things, ammonia, were formerly much used in medicine, under the titles of oil of hartshorn, volatile salt of hartshorn, spirits of hartshorn, &c.; but they are now replaced by a solution of ammonia and carbonate of ammonia, the sal volatile of the shops. See AMMONIA, LINIMENTS.

Hart's-tongue (*Scolopendrium*), a genus of widely distributed ferns, of which one species, *S. vulgare*, is a native of Britain, and is common in many parts of the country, in moist woods, shady banks, caves on the seashore, and other cold and damp situations. Its fronds are in general undivided although sometimes forked from a few inches to 2 feet in length, and from 1 to 3 inches in breadth. The *sori* are in transverse lines on the lateral veins. Fine plants of this fern are very

Hart's tongue (*Scolopendrium vulgare*).

ornamental, and attain their greatest luxuriance in winter.

Hartz. See HARZ.

Hartzenbusch, JUAN EUGENIO, a Spanish dramatic poet of German extraction, was born at Madrid, September 6, 1806, studied under the Jesuits, and produced his first book, the drama *Amantes de Teruel*, in 1836. His principal works, all published at Madrid, are the drama *Doña Mencia* (1838), the comedies *La Redoma Encantada* (1839) and *La Visionaria* (1840), and the dramatic poems *Alfonso el Casto* (1841), *El Bachiller Mendarias* (1842), *La Coja y el Encogido* (1843), and others. He also published in prose *Cuentos y Fabulas* (1861), *Obras Escogidas* (1865), and *Obras de Encargo* (1864). His writings are characterised by glowing imagination, vigorous diction, and sonorous versification. Besides his original works he issued good critical editions of the plays of Tirso de Molina, Calderon, and Lope de Vega. During the greater part of his life Hartzenbusch was employed in the national library at Madrid, of which he became director in 1862. He died at Madrid, 3d August 1880.

Hârûn. See HAROUN.

Haruspices (Sanskrit *hirâ*, 'entrails;' cf. Gr. *chordē, cholades*), soothsayers or diviners among the Etruscans, and from them adopted by the Romans, who foretold future events from the inspection of the entrails of animals offered in sacrifice (hence also called *extispices*), and from the observation of other circumstances connected with the offerings, such as the willingness or unwillingness of the victim to come to the altar, and the flame or the smoke. They took indications also from earthquakes, lightning, and all other extraordinary phenomena of nature called *portenta*. The haruspices did not equal the augurs in dignity and respect; they were regarded rather as mediums of communication with heaven than as possessing any independent religious authority. They had no organisation like the augurs; they did not, in earlier times at least, form a *collegium*, nor had they a *magister*. Their art fell latterly into disrepute, as is illustrated by the well-known saying of Cato that 'he wondered that one haruspex did not laugh when he saw another.' See AUGURIES, and DIVINATION.

Harvard University, founded as a college in 1638, is the oldest, richest, and best equipped of the institutions of learning in the United States. It is located at Cambridge (q.v.), Massachusetts, and its numerous buildings (nearly fifty) are the chief features of the town. It was named in honour of the Rev. John Harvard, who was probably born in Southwark in 1607, graduated in 1635 at Emmanuel College, Cambridge, came to New England

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in 1637, and, dying in 1638, bequeathed to the proposed college his library of over 300 volumes and £779. During the colonial period the avowed object of Harvard College was 'the education of the English and Indian youth in knowledge and godliness,' mainly with a view to their entering the Puritan ministry: only one Indian ever graduated (in 1665). In its infancy the college was supported by voluntary contributions from the churches, and by grants from the Massachusetts colony, but for a long time it was a rather obscure and feeble school. Its expansion into a university, its deliverance from sectarian control, and its independence from the state have been accomplished during the 19th century. During the same period its resources have enormously increased, and almost wholly from private donations. It was mainly under the rule of the state until 1865, when by statute the government was vested in a board of thirty overseers, in six classes of five members each, chosen by the alumni; one class being renewed annually. The overseers direct the courses of study and general management, but the nominations of professors and other officers are made by the 'corporation,' consisting of the president and five fellows, a self-perpetuating body, originally created by charter in 1650, and holding all the property of the university as trustees. The nominations made by the 'corporation' require confirmation by the overseers.

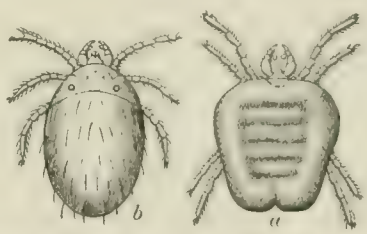
The halls for 'recitations' and lectures, and for students' lodgings, as also the chapel, library, and law-school, are in a square called the college yard, containing about 15 acres, planted with beautiful elms. The other buildings are in other parts of the town, not far distant, and occupy about 60 acres. The Agassiz museum of comparative zoology is world-famous. The Peabody museum of American archæology and ethnology dates from 1866; and in 1890 a sum of $50,000 was given to found a museum of Semitic antiquities. The most imposing edifice is Memorial Hall, built in honour of the alumni who fell during the civil war. It is 310 feet in length, and 115 in breadth, and has a tower 200 feet high. An ample vestibule contains busts and mural tablets. The principal hall is 164 by 60 feet, and 80 feet to the ceiling. This has a fine collection of historical portraits. It is used as a dining-hall, and accommodates nearly 700 at table. At the eastern end is a beautiful theatre for public exercises on ceremonial occasions. Memorial Hall, built of brick and freestone, in Norman style, richly ornamented, needs only the mellowing touch of age to be one of the most impressive collegiate buildings in the world.

In the academic department the requirements for admission are high, and as a consequence few students enter before the age of eighteen. There is a choice of two lines of study, both including ancient classics, mathematics, and other sciences; but in one line the classics are prominent, in the other the sciences. There are also various minor elections of study; but no degree is given without some full course, thoroughly carried out. As the university is amply endowed, there are many scholarships in all the departments, besides prizes and aids of many sorts, amounting to about $45,000 per annum. Morning prayers are conducted by clergymen of different denominations in turn; and students must attend Sunday services at the church designated by their parents. The general library contains above 250,000 volumes; and other libraries raise the total to 360,000 volumes. There is a well-equipped observatory, besides a botanic garden and an arboretum. There are no fees payable to professors; each student on matriculation pays a general fee, and may attend as many courses as he elects. Expenses vary with the habits of the student, but necessary expenses need not exceed $1000 (£200) per annum.

The following are the departments included in the university: Harvard College, the Divinity School, the Law School, the Lawrence Scientific School, the Medical School, the Dental School (in Boston), the Bussey Institution (a school of agriculture), the School of Veterinary Medicine (in Boston), and the Graduate Department. Further, Radcliffe College (formerly called Harvard Annex) was organised in 1879 for the collegiate instruction of women by professors and instructors of Harvard; a four years' course preparing for a certificate corresponding to the B.A. degree. The total strength of the teaching staff in 1895 was close on 300 (about 100 being professors proper), and of the students near 3000, of whom 1700 were at the college — the others being at the various other connected institutes or departments. The total income is considerably more than $1,000,000 a year; the invested funds (exclusive of lands, buildings, books, and apparatus) amount to about $8,500,000. Though wholly unsectarian, the college has largely been in the hands of Unitarians. Amongst the alumni have been the Adamses, the Danas, Channing, Theo. Parker, Motley, Prescott, Bancroft, Emerson, Wendell Phillips, O. Wendell Holmes, Parkman, Lowell, Child, and Norton.

See J. Quincy, *History of Harvard University* (1860); Rendle's monograph on John Harvard (1885); Thayer, *An Historical Sketch of Harvard University* (1891); *Four American Colleges* (1895); Birkbeck Hill, *Harvard College, by an Oxonian* (1895).

Harvest-bug, the larval form of the silky Trombidium (*Trombidium holosericeum*—Linn.) of the family Trombidiidæ, order Acarina. It is of minute size, scarcely discernible by the naked eye, and of a bright scarlet or vivid crimson colour. In the hot months of summer it is found in gardens



a, *Trombidium holosericeum*, female (mag. 9 diameters); *b*, larva, full grown (Harvest-bug).

and on wild vegetation, being most plentiful in hot dry seasons in places near the sea and in chalky districts. It specially torments people with delicate skins, and the wound it produces causes a good deal of local irritation and also, in warmer countries, a considerable amount of constitutional disturbance. The most unpleasant symptoms are only observed in climates warmer than Britain; but the mite is troublesome enough in some parts of Scotland. M. P. Mégnin has investigated the life-history of the harvest-bug, or *rouget*, as it is called in France (see *Annales des Sciences Naturelles*, 6th series, vol. iv. 1876). He found the silky Trombidium (*T. holosericeum*), a bright scarlet species, from spring till July and August, when it suddenly disappeared. In April he found some males with many young females, in the end of May and in June only gravid females. In June and July eggs were laid, which hatched, producing the *rouget* or harvest-bug formerly described as *Leptus autumnalis*, an almost spherical six-legged larva, which soon found a host into whose skin it thrust its sharp mandibles. Forthwith its abdomen began to swell with the fluid imbibed, reaching ultimately

to about five times its original bulk, the head and thorax remaining of the same size as before. After hibernation, during which it digested and assimilated the nutritive juices stored up during its parasitic existence, it became the eight-legged nympha, exclusively a vegetable feeder and sexually complete. The harvest-bug infests not only human beings, but also dogs, cats, hares, and other smaller mammals, and even insects. The remedy employed for its bite is to extract the animal from the skin by means of a needle, and to allay the itching by rubbing the part affected with some essential oil. The ravages of the harvest-bug appear to be not confined to Europe, since a small animal found in Mexico, and called by the Indians *Thalsahuate*, seems to be, if not identical with, at least similar to the harvest-bug in its processes and effects.

Harvest-fly, the popular name in the United States for a species of Cicada (q.v.).

Harvest-moon. See Moon.

Harvey, Sir George, P.R.S.A., was born at St Ninians, near Stirling, in February 1806. He was apprenticed to a bookseller in Stirling, but in 1823 removed to Edinburgh, and entered the Trustees' Academy there. In 1826, when the Royal Scottish Academy was instituted, he was elected an Associate, though only in his twentieth year; he became a full Academician in 1829, president in 1864, and was knighted in 1867. He died 22d January 1876. Many of his works are well known through the medium of engravings. The principal are 'Covenanters' Preaching,' 'Battle of Drumclog,' 'A Highland Funeral,' 'Children blowing Bubbles in Old Greyfriars' Churchyard,' 'First Reading of the Bible in the Crypt of St Paul's,' 'Bunyan in Bedford Gaol' and 'Bunyan and his Daughter selling Laces,' 'Shakespeare before Sir T. Lucy,' 'The Curlers,' and 'Leaving the Manse.' In his later years Harvey devoted much time to landscape-painting.

Harvey, William, the discoverer of the circulation of the blood, was born at Folkestone, in Kent, on the 1st of April 1578. His father was a yeoman; and his brothers were merchants of weight and substance, *magni et copiosi*, in the city of London. After six years at Canterbury grammar-school, Harvey, then sixteen years of age, was entered at Caius College, Cambridge. He took his degree in arts in 1597, and, after five years' study at the university of Padua under Fabricius de Aquapendente, Julius Casserius, and other eminent men who then adorned that university, he obtained his diploma as doctor of medicine in 1602. He returned to England in the same year; and after receiving his doctor's degree from his original university, Cambridge, settled in London as a physician. In 1609 he was appointed physician to St Bartholomew's Hospital, and in 1615 Lumleian Lecturer at the College of Physicians—an office then held for life; and it is generally supposed that in his first course of lectures (in the spring of 1616) he expounded those original and complete views of the circulation of the blood with which his name is indelibly associated. It was not till the year 1628 that he gave his views to the world at large, in his celebrated treatise entitled *Exercitatio Anatomica de Motu Cordis et Sanguinis*, having then, as he states in the preface, for nine years or more gone on demonstrating the subject in his college lectures, illustrating it by new and additional arguments, and freeing it from the objections raised by the skilful amongst anatomists. He was appointed successively physician to James I. and Charles I.; and in 1633 we find that his absence, 'by reason of his attendance on the king's majesty,' from St Bartholomew's Hospital was complained of, and that Dr Andrews was appointed as his substitute, 'but without prejudice to him in his yearly fee or in any other respect'—a procedure which shows the esteem in which Harvey was held. We learn from Aubrey that he accompanied Thomas Howard, Earl of Arundel, in his embassy to the emperor in 1636; and during this journey he publicly demonstrated to Caspar Hofmann, the distinguished professor of Nuremberg, and one of the chief opponents of his views, the anatomical particulars which made the circulation of the blood a necessary conclusion—a demonstration which, it is reported, was satisfactory to all present save Hofmann himself, who still continued to urge futile objections. To appreciate the importance of Harvey's discovery and the nature of the objections that would be urged against it, it is sufficient to state that Harvey's first step was to prove that the arteries contained not air but blood. The whole course of the circulation could not be demonstrated, as Harvey had no idea of a system of capillaries uniting arteries and veins. These were discovered by Malpighi some fifty years later. He attended the king in his various expeditions, and was present with him at the battle of Edgehill (October 23, 1642). 'During the fight,' says Aubrey, 'the Prince and Duke of York were committed to his care. He told me that he withdrew with them under a hedge, and tooke out of his pockett a booke, and read. But he had not read very long before a bullet of a great gun grazed on the ground neare him, which made him remove his station.' He accompanied the king after the battle to Oxford, where he resided nearly four years, receiving the honorary degree of Doctor of Physic, and being elected warden of Merton College. On the surrender of Oxford to the Parliament in July 1646, he left the university and returned to London. He was now sixty-eight years of age, and seems to have withdrawn himself from practice and from all further participation in the fortunes of his royal master. During the remainder of his life he was usually the guest of one or other of his brothers, now men of wealth and high standing in the city; and it was at the country-house of one of them that Dr Ent visited him at Christmas 1650, and after 'many difficulties' obtained from him the MS. of his work on the generation of animals, which was published in the following year, under the title of *Exercitationes de Generatione Animalium*.

From this period to the time of his death the chief object which occupied his mind was the welfare and improvement of the College of Physicians. In 1654 he was elected president of the college, but he declined the office on account of his age and infirmities. In July 1656 he resigned his Lumleian lectureship, which he had held for more than forty years; and in taking leave of the college presented to it his little patrimonial estate at Burwash, in Sussex. He did not long survive, but, worn out by repeated attacks of gout, died at London on the 3d June 1657, and was buried in a vault at Hempstead, near Saffron Walden, in Essex. On 18th October 1883, at the cost of the Royal College of Physicians, his remains were removed from the dilapidated vault, and with befitting solemnity reinterred in a marble sarcophagus in the Harvey Chapel attached to the same church.

Harvey's works in Latin were published in 1766; a translation by Dr Willis in 1847 (new ed. 1884); and his *Prælectiones Academicæ* by a committee of the Royal College of Physicians in 1887. See Willis's *Life of Harvey* (1878), Huxley at the Tercentenary (*Nature*, 1878), and D'Arcy Power (1897). A statue of Harvey was erected at Folkestone in 1881.

Harwich, a municipal borough, seaport, and market-town of Essex, is situated on a promontory

at the influx of the confluent Stour and Orwell to the sea, 71 miles by rail NE. of London. Southward of Harwich is the watering-place of Dovercourt, with a sea-wall 2 miles long. The chief industries are shipbuilding, fishing, and the manufacture of cement. Steamers run daily to Ipswich, and there are regular lines of packets to Antwerp, Rotterdam, London, &c. The harbour is capacious, safe, and commodious, having been much improved since 1844. It is defended by a battery, and, on the Suffolk side, by Landguard Fort, which dates from the reign of James I. So great have been the encroachments made by the sea on the promontory on which Harwich stands that two jetties or groins, 1350 and 1000 feet long respectively, were undertaken in 1863 to break the force of the waves, and these have proved very successful. From the 14th century till 1867 Harwich returned two members, and from then till 1885 one. Pop. (1851) 4451; (1881) 7842; (1891) 8191.

Harz Mountains, a mountain-range of Germany, extending between the rivers Weser and Elbe, south of Brunswick, with a length of 57 miles, a breadth of 20, and a superficial area of 784 sq. m. It forms an elevated plateau, rising on most sides somewhat steeply from the plains, and ridged with irregular and in some parts forest-clad mountains. The range, which is divided into Upper and Lower Harz, the average elevations of which are 2100 and 1000 feet respectively, is composed for the most part of rocks belonging to the Devonian and Lower Carboniferous formations, and broken through in a few places by granite, as in the Brocken (q.v.), the highest peak (3740 feet) of central Germany. The Harz are exceedingly rich in metals and minerals, as silver, iron, lead, copper, zinc, marble, alabaster, and granite. These mountains form a natural line of division between the Low German and the High German races. Industries connected with the mines and the forests, as well as some cattle-breeding and agriculture, afford employment to the inhabitants. The rearing of singing-birds is also a source of profit. The Harz Mountains are the scenes of many of the weird legendary tales of German literature.

Hasdrubal ('he whose help is Baal'), the name of several Carthaginian generals, of whom the most famous was the son-in-law of Hamilcar Barca (q.v.). In 237 B.C. he accompanied Hamilcar into Spain, and gave that general most effective aid in the work of building up a Carthaginian dominion in the Peninsula. On the death of Hamilcar in 228 B.C. the task of administering and extending the new empire devolved on Hasdrubal, who advanced the Carthaginian frontier from the Bætis (the Guadalquivir) to the Tagus, and founded a new capital, Nova Carthago (the modern Cartagena), a city with the best harbour on the south-east coast of Spain, and situated in the vicinity of rich silver-mines. Hasdrubal proved himself an admirable administrator. He was remarkably successful in conciliating the Iberian tribes, and extended his rule mainly by peaceful means. So independent was he of the home government that the Romans made a treaty in which the Ebro was fixed on as the frontier line, not with Carthage, but with Hasdrubal. In the eighth year of his command, 221 B.C., he was assassinated by a Celtic slave.—Another Hasdrubal was the son of Hamilcar Barca, and the brother of Hannibal (q.v.). He defeated Cneius Scipio in Spain in 212 B.C., and in 208 marched through Gaul, to join his brother Hannibal in Italy. He crossed the Alps in favourable weather, but, instead of pushing southward, made a fatal delay at Placentia, and was surprised and slain on the Metaurus in 207 B.C.—A third Hasdrubal was one of Hannibal's principal officers in the Italian campaigns. He made a brilliant charge at the battle of Cannæ, which contributed greatly to decide the fate of the day.—A fourth general of the same name defended Carthage against the Romans during the siege which ended in the city's destruction in 146 B.C. He is accused of cowardice and cruelty, and of having starved the citizens while himself living in revelry.

Hase, KARL AUGUST VON, a celebrated German theologian, was born at Steinbach, in Saxony, 25th August 1800. After being expelled from Erlangen University for his connection with the political students' unions called the 'Burschenschaften,' he became in 1823 a university tutor at Tübingen, but after a new investigation was imprisoned for ten months in the fortress of Hohenasperg. He settled at Leipzig in 1829, and in the following year was called to Jena as professor of Theology. Here he remained till his retirement in 1883, when, after sixty years of teaching, he was ennobled, and appointed a privy-councillor. His chief writings are *Des alten Pfarrers Testament* (1824); *Lehrbuch der Evangelischen Dogmatik* (1826; 6th ed. 1870); *Gnosis* (3 vols. 1826–28; 2d ed. 1870); *Hutterus redivivus* (1828; 12th ed. 1883), which was an able attempt to present dogmatic theology in the form that Hutter would have chosen, had he been living in the present century, and involved him in a long controversy with Röhr, the exponent of 'vulgar-rationalism:' *Das Leben Jesu* (1829; 5th ed. 1865); *Kirchengeschichte* (1834; 11th ed. 1886); *Die beiden Erzbischofe* (1839); *Neue Propheten* (1851; 2d ed. 1860); a life of St Francis (1856); a handbook of Protestant polemical theology (1863); a life of St Catharine of Siena (1864); *Geschichte Jesu* (1876); *Des Kulturkampfes Ende* (1879); and lectures on church history (1880). He subsequently began the publication of a church history based on his university lectures (1885 *et seq.*). His autobiography down to 1830 is entitled *Ideale und Irrthumer* (1872; 2d ed. 1873). Hase was called the Nestor of modern scientific theology. He did great service in the reconciliation of the church's faith to modern thought, and was an equally resolute and effective opponent of orthodoxy on the one hand and rationalism on the other. He died 3d January 1890.

Haselrig (otherwise HESILRIGE or HAZLERIGG), SIR ARTHUR, one of the Five Members (q.v.), commanded a noted regiment of cuirassiers called the 'Lobsters' on the side of the Parliament, took an active part in the House of Commons in connection with the militia and other bills, and was governor of Newcastle. In 1660 he half acquiesced with Monk in the Restoration, but died a prisoner in the Tower, 7th January 1661.

Hashish, from which the word *assassin* is derived, is an Arabian preparation of Indian hemp, known in India as *bhang* or *siddhi*. It consists chiefly of the leaves and stalks of *Cannabis indica*. The medicinal value of the preparations of Indian hemp is treated in another article; see HEMP (INDIAN). It is the physiological action which will now be specially noticed. The drug is used in the East in various ways. Sometimes it is smoked alone or with tobacco. At other times beverages are prepared from it, or it is taken in the form of lozenges or electuaries. The *majoon* of Calcutta, the *mapouchari* of Cairo, and the *dawames* or *dawamese* of the Arabs are preparations of this kind. The effects differ according to the dose and the idiosyncrasy of the individual. Some become pugnacious, while others fall into a state of reverie. After small doses there is a great tendency to causeless merriment. In most cases there is an extraordinary susceptibility to hallucinations of various kinds, their nature depending largely on the cast

of mind of the person, and to some extent on his surroundings. Time, distance, and sound are no longer correctly judged of. A minute may have compressed into it the action of a month, a hand breadth may stretch out to a mile, and the ripple of a brook may swell into the roar of Niagara. Although the dreams produced in Orientals by the drug are often of a voluptuous nature, this is by no means a universal effect, and among Europeans they have not this character. The stage of hallucination is generally succeeded by a stage of deep slumber with diminished sensibility. The unpleasant after-effects of opium seem to be absent; but the use of hashish has the inevitable demoralising effects of all such indulgences. See Moreau, *Du Hachisch et de l'Aliénation Mentale* (1845).

Haslar Hospital, to the south of Gosport (q.v.), between Haslar Lake and the sea, is an enormous establishment for the officers and men of the navy, dating from 1746, and capable of accommodating 2000 patients. The Royal Naval Chapel is also here, and beyond are the Haslar barracks.

Haslingden, a municipal borough (since 1891) of Lancashire, 19 miles NW. of Manchester. Cotton, silk, and woollen manufactures are carried on. In the vicinity are ironworks, coal-mines, and stone and slate quarries. Pop. (1851) 6164; (1881) 16,298; (1891) 18,225.

Hasmoneans. See MACCABEES.

Hassan-ben-Sabah, the 'Old Man of the Mountain' of European story, was founder of the Moslem sect of the Assassins (q.v.).

Hasse, JOHANN ADOLF, composer, was born at Bergedorf, near Hamburg, 25th March 1699, and studied in Italy under Porpora and Scarlatti. He became famous as *Il Sassone* ('the Saxon') through his opera *Sesostrate*, produced at Naples (1725); was *kapell-meister* at Dresden; and was brought to London in 1733 to head an opposition to Handel as representing the Italian school. Here *Artaserse* was produced with success; but Hasse soon left London, and in 1740 was in Dresden, subsequently retiring to Vienna and to Venice, where he died 23d December 1783.

Hasselt, capital of the Belgian province of Limburg, situated 18 miles by rail NW. of Maastricht, has several distilleries, manufactures linen fabrics, lace, and tobacco, and cultivates tobacco, madder, and chicory. Pop. 13,194.

Hâstinapur, a ruined city of India, on the old bed of the Ganges, 22 miles E. of Meerut. It was the capital of the great Pandava kingdom, frequently mentioned in the Mahâbhârata.

Hastings, a parliamentary and municipal borough and famous watering-place of Sussex, is picturesquely situated on the shore, and surrounded by high cliffs on all sides except the south, which is open to the sea. By rail it is 33 miles E. of Brighton and 62 miles SSE. of London. It consisted formerly of only two streets, intersected by a small stream called the Bourne, but is now a large place, whose resident population is doubled during the holiday season. Since the middle of the 19th century the borough has been greatly extended, and some portion of the hills which shelter the town contain several fine streets and terraces. The breezy and nicely-paved esplanade, over 3 miles in length, forms one of the finest sea-walks and drives in the kingdom. The climate is dry and agreeable, and the bathing very good. During cold weather in winter and spring the place is a commended resort for pulmonary complaints, being sheltered by the hills inland from easterly and northerly winds. It is famous for the mildness, salubrity, and evenness of its climate, the mean daily range of shade temperature being remarkably small (9·9) as compared with nearly all other stations on the south coast. It has been said to offer a choice of three climates—the mild of the sea front, the more bracing of the inland, and the extremely bracing and invigorating of the surrounding hills, 500 feet above the sea. The sandy soil secures a dryness of soil and atmosphere not usually to be had at seaside resorts. According to Dr Parsons, 'the hottest days in summer are eight degrees cooler than London, and, contrary to general belief, three degrees cooler than Eastbourne.' The drainage is good, the *British Medical Journal* stating that 'Hastings is one of the best drained and ventilated of seaside places.' The water-supply is pure and abundant; and salt water is laid on for watering the streets, and can be supplied direct from the main to private houses for bath purposes. The corporation have purchased for a considerable sum the East and West Hills, fine open plateaus commanding beautiful land and sea views, and admirably adapted for golf and other outdoor sports.

The East Hill Cliffs present great interest to geologists, and are part of the property purchased. They descend sheer into the sea, and are remarkable for their rugged beauty as seen from the ocean. There are three large public gardens, one of them exceedingly pretty, and an extensive Alexandra Park, opened by the Prince and Princess of Wales in 1882. The amusements of the place are many and varied. Hotels are plentiful, and several large and flourishing schools have been established, the Hastings centre taking a large place in the Oxford and Cambridge local examinations. A great attraction is the pier, extending 900 feet, and having a spacious pavilion at the sea end giving accommodation for between 2000 and 3000 persons. A similar pier was, in 1890, in course of construction at St Leonards, about a mile westwards. The 'premier Cinque port' is the largest and richest fishing-station on the south coast. On 16th June 1897 Lord Dufferin laid the foundation of a new harbour of 27 acres. The ruined castle was built by a follower of the Conqueror. Hastings (since 1885) returns only one member to parliament. Pop. of parl. borough (1851) 17,011; (1881) 42,258; (1891) 52,340. See W. D. Cooper's *Notices of Hastings* (1862); and Montagu Burrows' *Cinque Ports* (1888).

THE BATTLE OF HASTINGS is the usual name given to the great battle at Senlac, near Hastings, in which the English under King Harold were completely defeated by the Norman invaders under William the Conqueror, October 14, 1066. From that fatal day until now the place has borne the name of Battle (q.v.). Harold's force was drawn chiefly from the southern counties, and was firmly posted on the Hill of Senlac, fortified with a stockade and ditch. The Normans were arranged in three divisions, the centre led by the redoubtable duke in person. The Norman foot began the battle, and it is said that the minstrel Taillefer, riding in front singing the Song of Roland, was the first to strike a blow and the first to fall. The Norman foot spent their fury in vain upon the English stockade, while the Bretons on the Norman left wing were quickly put to flight. A cry now arose that the duke was slain, and panic quickly spread throughout the army. 'I live,' shouted William, as he tore off his helmet, 'and by God's help will conquer yet,' and led on his men anew to the attack. Not, however, till by a counterfeited flight he had drawn the English in eager pursuit from their strong position was he able to break their line and obtain a footing on the high ground on which they had stood so stubbornly. With the quick eye of the true soldier, William now commanded his archers

to shoot high into the air that their arrows might fall from above. The English fell quickly, their shields being unable to protect their heads, and the king was soon struck down by an arrow in the right eye. The battle was now lost, but the housecarls fought where they stood till the last man was slain. See the third volume of Freeman's *Norman Conquest*.

Hastings, Francis Rawdon-Hastings, Marquis of, Governor-general of India, was descended from an old Anglo-Norman family settled in County Down, Ireland, and was born on 9th December 1754. Entering the army in 1771, he was engaged in many of the chief operations of the war of American independence, fighting at Bunker Hill, in Long Island and New Jersey, at the siege of Charleston, and at the battles of Camden and Hobkirk's Hill, and attained the rank of adjutant-general under Lord Cornwallis. On his return home he was created (1783) Baron Rawdon, and afterwards became intimate with the Prince of Wales. A year after he had succeeded his father as Earl of Moira he carried (1794) an army corps of 10,000 men across to Holland, to reinforce the Duke of York; and in the following year participated in the attack on Quiberon. Under the Fox-Grenville ministry he was in 1806 appointed master-general of ordnance; and he took an active part in politics until his appointment to the governor-generalship of Bengal in 1813. This high office he held down to 1821. The most momentous events of his administration were the war against the brave mountaineers of Nepal, the Goorkhas, who by the peace of 1816 were converted from aggressive enemies into the staunchest of allies; and in the next year the wars against the Pindáris and the Mahrattas, both of which were speedily brought to a successful termination, with the result that a large addition was made to the territories of the East India Company. For his masterly treatment of the Goorkha question Lord Moira was created Marquis of Hastings (1816). His policy in India included the encouragement of native education and of the freedom of the press, a reform in the law system, and the elevation of the status of the civil service. His resignation was caused by imputations levelled against his public conduct in connection with the affairs of a banking firm. In 1824, the year after his return home, Lord Hastings was appointed governor of Malta, and he held this office until his death, at Baiæ, near Naples, on 28th November 1826. See his *Private Journal*, edited by his daughter (2d ed. 1858); Prinsep's *Administration of the Marquis of Hastings* (1825); *Asiatic Journal* (1823); and Ross's monograph in the 'Rulers of India' series (1893).

Hastings, Warren, was born at Churchill, in Oxfordshire, 6th December 1732. He was descended from the family of Hastings of Daylesford, but the estate had passed out of the family, and Hastings, who was early left an orphan, was educated at the expense of an uncle. He distinguished himself at Westminster School, where he was contemporary with the poets Churchill and Cowper, with the future Lord Shelburne, and with Elijah Impey (q.v.). In 1750 he went out in the Civil Service of the East India Company, and was at first employed in the secretariat in Calcutta. He was up the country at the time of the Black Hole affair, but made his escape and joined the refugees at Falta Ghat, where he married his first wife; she died after bearing two children, who lived but a few years. Left a widower, Hastings returned to England in 1764, where he spent five years and made the acquaintance of Dr Johnson. In 1769 he returned to India as second-in-council at Madras, and in 1772 proceeded to Bengal, where he was promoted to the presidency of the council. A year later the British parliament produced the Regulating Act, under which Hastings was to be governor-general with a handsome salary, and was to be assisted by a council of four members, three appointed from home. This was the beginning of trouble; the majority in council led by Francis was opposed to Hastings from the first; the finances were in great disorder, the demands of the Company for remittances were frequent and urgent. One of Hastings' first tasks was to bring to trial the chief fiscal ministers of Bengal, Rája Shatáb Rai and Nawáb Muhamad Raza, on charges of malversation and embezzlement. This, though done under positive orders from home, proved injurious to Hastings' popularity. A corrupt and treacherous official, Nuncomar (Rája Nand Kumar), was employed in conducting the case; and when it broke down all three became his enemies. In 1775 Nuncomar was tried, sentenced, and executed for forgery, a proceeding which threw obloquy on Hastings and on the chief-justice, Sir Elijah Impey, which has been much dispelled in recent times. Among measures of domestic reform, Hastings made an appraisement of the landed estates which formed the assets of a great portion of the public revenue, and on that appraisement based a revised assessment. He also improved the administration of justice in the country courts and organised the opium revenue. In his external policy he was no less energetic and original. He waged vigorous war with the Mahrattas, and made the Company's power paramount in many parts of India. He contracted advantageous alliances and restored the financial position of the Company. All this was not done without encountering opposition and censure. In 1777 an attempt was made to depose him, on the strength of a conditional resignation which he had sent home; and the attempt was only frustrated by the action of the Supreme Court, of which Impey was still chief-justice. In the same year Hastings married the divorced wife of Baron Imhoff, a German officer. In 1780 he was finally freed from embarrassment by the opposition owing to the retirement of its leader, Philip Francis, whom he wounded in a duel.

At the end of 1784 he resigned office and sailed for England, where he was well received by King George III., but soon became subject to a parliamentary inquiry, with a view to impeachment. Into the details of the charges brought against him we cannot here enter. Among the chief misdeeds alleged against him were the aid that he gave to his ally the Nawáb of Oudh in the war against the Rohilla Afghans, his punishment of the Zemindar of Benares for non-compliance with a demand for aid in the first Mahratta war, and his connivance in the forfeiture of property—real and personal—which had been conferred on the Begums or dowager-princesses of Oudh. Charges on these subjects were preferred by the Whig opposition, and Hastings, being deserted by Mr Pitt, was impeached at the bar of the House of Lords. The trial began 13th February 1788 in Westminster Hall, among the managers for the Commons being Edmund Burke, Fox, Sheridan, Elliott (afterwards Lord Minto), and Mr (afterwards Earl) Grey. The early sittings were numerously attended, and the audience was rewarded by splendid displays of rhetoric; but the public interest soon flagged. It was felt by those persons who knew or cared about the matter at all that the alleged errors of Hastings were overbalanced by great public services. He had prevailed in war; he had left Bengal at peace; he had organised the administration in all its branches; he had fostered learning; above all, he had founded an empire which no one thought of abandoning. The trial dragged itself through more than seven years and nearly 150 sittings. At last,

on the 23d April 1795, Hastings was acquitted on all the charges, unanimously on all that affected his personal honour. Out of the original members who had met in Westminster Hall when Hastings first bowed his knee at the bar but twenty-nine were left to vote for the final award; the remaining peers stood round the throne as spectators. Hastings left the court a ruined man, the small fortune that he brought from India having been quite consumed in the expenses of the defence. But the Court of Directors came to his aid and made provision for his declining years. Carrying out what is said to have been an aspiration of his youth, Hastings bought the old family seat of Daylesford, in Worcestershire, where he passed the rest of his life in the occupations of a country gentleman, varied by occasional visits to London. He gave evidence before parliamentary committees, and dined at Carlton House; the prince-regent made him a privy-councillor; and he received honours from the city and the Houses of Parliament. He died at Daylesford, 22d August 1818, his wife surviving him. In his long and active career Hastings showed constant energy, courage, judgment, and application. In his private life he was gentle and unselfish. He left no children.

See Gleig's *Memoirs* (3 vols. 1841); Mill's *History of India*, corrected by Wilson's notes; Stephen's *Story of Nuncomar*; Trotter's *Biography* (1878); the article by the present writer in the *Dictionary of National Biography*; Lyall's *Warren Hastings* (1889); Strachey's *Hastings and the Rohilla War* (1892); Forrest's *Administration of Warren Hastings* (1892); Col. Malleson's *Life of Warren Hastings* (1894); and Sir C. Lawson's *Private Life of Warren Hastings* (1896); Macaulay's eloquent essay is untrustworthy.

Hastings Sands, the lower division of the Wealden beds, part of the Lower Cretaceous series. The beds consist chiefly of sand and sandstone with subordinate layers of clay, and vary in thickness from 500 to 1000 feet; and the group embraces, in descending order: (3) Tunbridge Wells Sand, (2) Wadhurst Clay, (1) Ashdown Sand. The strata differ very little from those of the overlying Weald Clay, except in being more arenaceous. The beds have been deposited in shallow fresh water. The sand often exhibits fine specimens of ripple-marks, and the clay which separates the sand-beds sometimes contains cracks that have been produced by the drying of the surface on exposure. The strata are highly fossiliferous. There are numerous saurian reptiles, including the huge iguanodon and the flying pterodactyle. The remains of several chelonians also occur. The fish belong chiefly to the ganoid or placoid orders, the most remarkable being the lepidotus, whose conical palate teeth and thick square enamelled scales are very frequent. The shells belong to genera which inhabit fresh water, such as Paludina, Cyclas, and Unio.

Hat, the principal head-covering of the human family, distinguished from the cap or bonnet by having a brim around it. The history of the hat is of necessity intimately mixed up with that of head-coverings generally, the distinctions of bonnets, hats, and caps being arbitrary and subject to many variations with changing fashion (see illustrations in article Fashion). The hat, as a roomy brimmed head-covering, is the direct descendant of the *petasus* of the ancient Greeks, which was distinguished from the other Greek head-gear, the *pileus*, by the possession of a brim, useful for protecting its wearer from the rays of the sun. These Greek hats were made of felt, the material of which the head-gear of early times appears to have been principally fabricated. The use of felted hats became known in England about the period of the Norman conquest. The merchant in Chaucer's Prologue to the *Canterbury Tales* is described as having 'on his hed a flaundrish bever hat.' About the period of Queen Elizabeth beaver felts in many shapes became common, and for three centuries thereafter fine beaver hats, mostly dyed black, formed the head-covering of the higher classes in Great Britain. But now, though felt hats are the everyday wear of the community, there is no longer such a thing as a genuine beaver hat. See Beaver, Felt.

Hats at the present day are fashioned of an endless variety of materials, and, especially in the case of those worn by ladies, they are so diversified in form that they defy all definition. But with all their variations three principal classes of hat-manufacture may be distinguished, comprised under the felt-hat, the silk-hat, and the straw-hat trades. In the felt-hat trade, the materials now principally employed are the fur or hair of rabbits, with smaller proportions of hare, beaver, musk-rat, vicuna, and camel for the finer felts; and sheep's wool for the commoner felted hats. Felt hats of inferior quality are also made with wool mixed with cotton and other vegetable fibres—not in reality felted, but cemented by varnish which is used at once to hold together the fibres and to stiffen the hat body. In the felting of rabbit, hare, and other furs, a 'bat' is first formed, which consists of an expanded cone of equally distributed fibres in quantity sufficient to form the desired hat. To make this 'bat,' a perforated cone of sheet copper is caused to revolve slowly over a funnel under which there is a powerful blast drawing air inwards through the holes in the copper cone. Fur is fed towards and drawn over the surface of the cone in an equal manner by the suction, and is so held in position till a sufficient quantity to form the hat is uniformly distributed over it. A wet cloth is then wrapped around the mass, over which an outer cone is slipped, and the whole then dipped into an acidulated bath of hot water, and by pressure the first stage of felting—making the bat cohere—is secured. The subsequent operations are the same in making both fur and woollen felts. In the felting of wool for hats the bat is formed from carded wool wound diagonally round a double cone, which gives two bats. These are subjected to the usual operations of felting till a sufficient consistency of felt is obtained. The hats are thereafter roughly blocked on a mould to something of their ultimate form, then dyed, and when hard felts are to be made they are stiffened with a varnish of shellac. They are then shaped on a block, smoothed with sand-paper, bound, lined, and finished. The principal supply of rabbit fur for felting is obtained in France and Belgium from domestic rabbits, hundreds of millions being in these countries annually killed as articles of food and for the fur they yield.

The manufacture of silk hats as a substitute for piled beavers was first attempted about 1810, but it was not till 1830 that silk plush hats were successfully made in France. The silk hat consists of a body and rim, usually made of two or three layers of cotton cloth saturated with varnishes, to give the fabric stiffness and make it waterproof. These are moulded on wooden blocks according to the fashion of the day; and when the desired shape is produced the whole is carefully varnished over with lac and dammar varnish, and before dry the fine silk plush is applied with great nicety, so as to prevent the seams being perceived. It is then trimmed with silk braid on the edge of the brim, and a silken band round the junction of the body with the brim; and the lining of leather and thin silk being put in, it is complete. Opera-hats or crush-hats consist of a covering of merino stretched over a spiral steel frame, which by pressure flattens down, so that they can be easily carried.

The manufacture of straw hats, which forms an

entirely distinct branch of the hat trade, will be dealt with under Straw-plait (q.v.). In the United Kingdom the felt-hat trade is principally centred at Denton and other villages in the neighbourhood of Manchester. In the year 1888 there were exported from the United Kingdom 1,331,627 dozen hats of all kinds, valued at £1,252,017.

Hatch, EDWIN, a learned theologian, born at Derby, 4th September 1835. He was educated at King Edward's School, Birmingham, and at Pembroke College, Oxford, and took a second-class in classics in 1857. After some years of teaching as professor of Classics at Trinity College, Toronto, and rector of Quebec High School, he returned to Oxford as vice-principal of St Mary Hall in 1867, a post which he held till his resignation in 1885. He was appointed rector of Purleigh, Essex, in 1883, and next year reader in Ecclesiastical History at Oxford. The Grinfield lectureship on the Septuagint he held from 1880 to 1884. His articles on such heads as 'Ordination,' 'Priest,' &c., in Smith and Cheetham's *Dictionary of Christian Antiquities*, had already attracted wide attention, when his profoundly learned and admirably argued Bampton Lectures, in 1880, on *The Organisation of the Early Christian Churches*, firmly established his reputation both in England and Germany as one of the ablest and best-equipped theologians of the time. The book struck a blow at the roots of High Church claims, and proved to be more easily denounced than answered. It had the honour to be translated by Harnack. In 1888 he delivered a course of Hibbert Lectures on *Greek Influence on Christianity*. Hatch was made D.D. by Edinburgh in 1883; published in 1887 *The Growth of Church Institutions*, a profoundly learned book, though written in a bright and popular style; *Essays in Biblical Greek* in 1889; and had made considerable progress with his projected *Concordance to the Septuagint* when his career was cut short by untimely death, at Oxford, 10th November 1889. A collection of noble religious poetry, *Towards Fields of Light* (1889), and a volume of striking sermons, *The God of Hope* (1890), appeared posthumously, the latter with a brief biographical sketch by his brother. See Dr Sanday in the *Expositor* for February 1890.

Hatching. See INCUBATION, POULTRY.

Hatchment. ACHIEVEMENT, or FUNERAL ESCUTCHEON, the arms of a deceased person within a black lozenge-shaped frame meant to be placed on the front of his house. If the deceased was unmarried or a widower or widow the whole field of the escutcheon is black. In the hatchment of a married person only that part is black which adjoins the side of it occupied by the arms of the deceased. Thus, in the hatchment of a husband the dexter side is black, the sinister white; in that of a wife the reverse. The old funeral escutcheon of Scotland, similarly to that of Germany, had the *seize quartiers* of the deceased arranged round his personal arms, and in strictness no one, unless his ancestors on every side up to four generations had armorial rights, was entitled to a funeral escutcheon. Escutcheons of this kind are now seldom seen even in Scotland. The black frame is sometimes powdered with drops to represent tears, and the skull and cross-bones at the corners are hardly out of use.

Hatchment of Husband.

Hatfield, or BISHOPS HATFIELD, a market-town of Hertfordshire, 18 miles NNW. of London by rail. There exist a few scanty remains of the 12th-century palace, once the property of the bishops of Ely, but, together with the manor, seized by Henry VIII., and successively the residence of that king, of Edward VI. and Queen Elizabeth before their accession, and of James I. Hatfield House, the seat of the Marquis of Salisbury, was built by Sir Robert Cecil in 1611, and is a fine specimen of Jacobean architecture, rich in portraits and historical manuscripts. Pop. of parish (1851) 3862; (1891) 4330. See a fine account of its history in Brewer's *English Studies* (1881).

Hatfield Chase, a fenny tract of land in the West Riding of Yorkshire, lying between the Trent and Doncaster, some 180,000 acres in extent, which has been drained, and is now cultivated. See *The Level of Hatfield Chace*, by John Tomlinson (1882).

Hatherley, SIR WILLIAM PAGE WOOD, BARON, Lord Chancellor of Great Britain, was born in London in 1801, and educated at Winchester, and Trinity College, Cambridge, and subsequently called to the bar. He was returned in 1847 as Liberal member for Oxford, in 1851 was appointed solicitor-general and knighted, in 1853 became vice-chancellor, in 1868 a lord justice in the Appeal Court and lord chancellor, being at the same time raised to the peerage as Baron Hatherley. His name is associated with a Bankruptcy Act of 1869. He resigned office in 1872 in consequence of failing eyesight, and died on 10th July 1881. From his pen came *Truth and its Counterfeits* (1857) and *The Continuity of Scripture* (1867–69). See *Memoir* by W. R. W. Stephens (1882).

Hathor, the name of an Egyptian goddess, ranked among the second class of deities, who was the daughter of Ra, the sun. See EGYPT.

Hathras, a well-built town of India, in the North-west Provinces, 21 miles S. of Aligarh. It is the commercial centre for the Upper Doab, and has a large export trade in sugar, grain, cotton, oil-seeds, and *ghi*, and imports iron and metal-wares, cloth, &c. The delicate carved work of the town is famous. Pop. (1891) 39,181.

Hátim et-Ta'í was chief of the Arabian tribe of Taï, and flourished shortly before the advent of Mohammed. He was renowned for his extraordinary liberality, and his name is at the present day synonymous throughout the Moslem world with all that is open-handed and generous. No greater compliment, indeed, can be paid to an Asiatic prince or noble than to style him 'a second Hátim.' Many anecdotes of his liberality and magnanimity are recounted by poets; thus Sa'di says: 'Hatim Taï no longer exists, but his exalted name will remain famous for virtue to eternity. Distribute a tithe of your wealth in alms, for when the husbandman lops off the exuberant branches from the vine it produces an increase of grapes.' See Clouston's *Group of Eastern Romances* (1889).

Hatteras, CAPE, a low point of North Carolina, forming part of a sandbank, in 35° 15′ N. lat. and 75° 31′ W. long. The coast-line here turns from the direction of north-east to that of due north; violent storms are frequent and render navigation dangerous, and the island is marked by a light raised 190 feet above the sea.

Hatti Sherif. See FIRMAN.

Hatto, the name of two archbishops of Mainz, who have a somewhat conspicuous place in the history of Germany. The first of these was chosen Archbishop of Mainz in 891, and died in 913.—The

second archbishop of that name was a monk of the monastery of Fulda, and succeeded the celebrated Rabanus Maurus, well known in the history of the eucharistic controversies, as abbot of the monastery of St Boniface, about the year 942. In the second expedition of the Emperor Otho I. into Italy in 961 Hatto was sent as his ambassador from Pavia to Rome; and after his return, on the death of Archbishop William, he was raised to the see of Mainz, and continued one of the chief directors of the imperial counsels. Of his after-life and of his personal character the most opposite accounts have been given. By some he is represented as a zealous reformer, and an upright and successful administrator; by others as a selfish and hard-hearted oppressor of the poor; and the strange legend of his being devoured by rats, which Southey has perpetuated in his well-known ballad, is represented as an evidence of the estimate that was popularly formed regarding him. It is by no means improbable, however, that this legend is of a much later date, and that its real origin is to be traced to the equivocal designation of the tower on the Rhine, Maüsethurm, near Bingen, which has been selected as the scene of the occurrence. *Mausethurm*, 'Mouse-tower,' is possibly only a corrupted form of *Mauth-thurm*, 'Toll-tower,' a sufficiently descriptive name; but the modified form of the word might readily suggest a legend of mice or rats. Another etymology is from *musaria*, an old word for ordnance. The date at which the Mausethurm was built is unknown, and it is far from certain that it is not much later than the time of Hatto. It was stormed by the Swedes in 1635. Archbishop Hatto died in 969 or 970. See Baring-Gould, *Curious Myths of the Middle Ages* (1869), and Max Beheim, *Die Mausethurm sage* (1888).

Hatton, JOHN LIPTROT, a self-educated musical composer, was born at Liverpool in 1809, and, settling in London in 1832, soon made his name known as a composer. From 1853 to 1859 he was musical director of the Princess's Theatre. He composed numerous operas, cantatas, overtures, entr'actes, &c., but is remembered chiefly for his musical settings of English songs, such as 'Goodbye, Sweetheart,' 'The Tar's Song,' 'When Evening's Twilight,' 'The Bait,' 'To Anthea,' &c. He died at Margate on 20th September 1886.

Hatzfeld (Hung. *Zsombolya*), a town of Hungary, 20 miles by rail W. of Temesvar. Pop. 8621.

Hauberk. See ARMOUR.

Hauch, HANS CARSTEN, Danish poet, was born at Frederikshald, in Norway, 12th May 1790. His first attempts in literature being unsuccessful, he began to study natural history; but in 1846 was appointed to the chair of Northern Literature in the university of Kiel. Two years later the Holstein revolution drove him back to Copenhagen; and on the death of his friend Oehlenschläger, in 1850, he succeeded him in the chair of Æsthetics at the university there, and held it down to his death, at Rome, 4th March 1872. Hauch's riper and more successful works embrace nine historical tragedies, all written between 1828 and 1850, in which he exhibits great powers of individualising character and portraying the local colouring of his scenes; *Lyriske Digte* (1842, 1862, and 1869), some of which are extremely beautiful, and enjoy an undisputed popularity in Denmark; and many tales and romances, &c. His epic-dramatic poem *Hamadryaden* (1830) met with warm appreciation in Germany. At Copenhagen there appeared in 1873–75 Hauch's *Samlede Romaner og Fortallinger*.

Hauff, WILHELM, German writer, was born at Stuttgart, 29th November 1802, and was educated at Tübingen. He acted for a couple of years as private tutor, and had been editor of the *Morgenblatt* for about three-quarters of a year when he died, 18th November 1827. Although only twenty-five at the time of his death, Hauff has left behind him works which have taken a permanent place in German literature; he has even become well known of late years, through several translations and editions of his best books, in Great Britain. This reputation is due to his *Marchen* or fairy-tales (1826–28) and his *Tales* (1828), all alike admirable for their freshness, simplicity, and playful fancy. Two of the latter, *Die Bettlerin vom Pont des Arts* and *Das Bild des Kaisers*, may be regarded as his masterpieces. The greatest effort of his playful fancy was, however, the exhilarating *Phantasien im Bremer Rathskeller* (1827). Some of his poems, of which he only wrote a few, have become *volkslieder*. All these works were but short; his longest productions were none of them so successful. The romance of *Lichtenstein* (1826), although popular in Germany, owing to its local fidelity and its being almost the first historical novel written in German in Sir Walter Scott's style, reveals several defects when tested as a work of art. His earliest lengthy work, *Memoiren des Satans* (1826–27), is an incomplete and immature production, but full of promise as an example of satiric humour. In the same vein Hauff wrote a parody of Clauren in *Der Mann im Mond* (1826), and an earnest satire against him in *Kontroverspredigt* (1826). His *Sammtliche Werke* were published by G. Schwab in 5 vols. in 1830 (18th ed. 1882).

Haug, MARTIN, Sanskritist, born 30th January 1826, near Balingen, in Wurtemberg, was professor at Pooma from 1859 to 1866, and at Munich from 1868 till his death, 3d June 1876. He wrote on the Pehlevi language, and on the Rig-veda, and *Essays on the Sacred Language, Writings, and Religion of the Parsees* (1862).

Hauksbee. See HAWKSBEE.

Haulbowline. See CORK.

Haunted Houses in former times were very common in every corner of England and Scotland, and many persistent traditions descended of unquiet spirits who were doomed to haunt for ever the spot on which they had wrought or suffered some deed of blood. Dim shadows of earthly forms, they continued into their ghostly existence the form and aspect that they wore in life, and the gaping and bleeding wounds of murder froze the heart of the beholder from age to age. Shrieks, wailings, wringing of the hands, knockings, infernal curses and blasphemies—such were some of the accessory horrors that the popular imagination cast around these ghostly creations, of whom many continued to possess, but in intensified form, all the power and disposition to evil which had belonged to them in life. These unquiet spirits could sometimes be *laid*, or compelled to rest finally in their graves, or the Red Sea, by the exercitations of clergymen of pre-eminent piety, who often contrived to exorcise them by passing a night of severe religious exercises alone in the haunted chamber or house. The inevitable decline of belief in the supernatural has swept away almost all our domestic ghosts, spite of the especial proneness of the popular imagination to this kind of belief. Of the haunted houses of Scotland, past or present, none are more famous than Glamis Castle, Cortachy Castle, and Spedlins Tower; no local ghosts were more persistent than those that haunted Newton Castle, Huntingtower, Allanbank, Woodhouselee, and Finhaven. In England, among the most striking cases are Corby Castle with its 'radiant boy,' Peel Castle with its 'Manthe Dog,' Ashley Hall, Skipsea Castle, Hilton Castle with its 'Cauld Lad,' Holland House, Rainham Hall with its 'Gray Lady,' Tharston Hall, Newstead Abbey, Powis Castle,

and Caistor Castle, round the courtyard of which drives every year a ghostly carriage drawn by four headless horses. No less rich in stories of haunted houses are Ireland, Wales, Brittany, and Germany, and no stories of this class are more weird and gruesome than the examples in the folklore of Russia. Spectral animals as well as men and strange lights were seen at some places, and there are authentic stories of undignified apparitions of whose presence mortals were made aware by their sense of smell. The 'Shuck Dog' of Norfolk is of large size and black colour, with great yellow eyes, and brings sure death to any one he meets. Sometimes, however, he is headless, or with but one blazing eye in the centre of his forehead. Indeed, the whole subject of spectral apparitions opens up a large chapter in popular demonology, which has been somewhat grotesquely overlaid with the theological conception of the devil.

Countless stories, old and new, are told of spirits that have at various times infested houses to the terror of their earthly inmates. Of these classical examples are those connected with Tedworth, testified to by Joseph Glanvill, and with Epworth Rectory, on the still less impeachable evidence of John Wesley. An interesting modern example of how stories of this kind can be manufactured even in our day, out of hearsay and third-hand statements, is that of the haunted house in Berkeley Square, which seems to have received its popularity and fame from being identified through some accidental circumstances as the scene of a similar story related in *Temple Bar* for 1868 by Rhoda Broughton of a house in the country. Those who are sufficiently interested can follow the growth, if not the actual genesis, of the story in a series of communications to *Notes and Queries*, sixth series, vols. ii. and iii.

See the article APPARITIONS and the books enumerated there; and particularly John H. Ingram's *Haunted Homes of Great Britain* (1884), and the *Proceedings* of the Society for Psychical Research, instituted in 1882.

Haupt, MORITZ, a Germanist and classical scholar, was born at Zittau, 27th July 1808, was professor at Leipzig from 1843 to 1850, and from 1853 in Berlin. He was secretary to the academy there, and died 5th February 1874. He edited several Latin classics (Ovid, Horace, &c.), and many Middle High German poems.

Haupur, a town of India, in the North-west Provinces, 18 miles S. of Meerut. Pop. 13,000.

Hauraki, a gulf and a gold-bearing peninsula of New Zealand, opposite Auckland (q.v.).

Haurân (anc. *Auranitis*), a large district in Syria, east of the Sea of Galilee. The name is sometimes restricted to one fertile plain there. See BASHAN; and works by Schumacher (1886), Conder, Palmer, Stubel, and Heber-Percy (1895).

Hauréau, JEAN BARTHÉLEMY (1812–96), historian, was born in Paris, and held posts in the National Library and the National Printing Office. He wrote on Poland, Francis I., Charlemagne, St Victor, &c., but is best known by his great *Histoire de la Philosophie Scolastique* (1872–81).

Hauser, KASPAR, a German youth, whose history, enshrouded in many elements of mystery, excited the attention of all Europe and especially of Germany. On the afternoon of 26th May 1828 a citizen of Nuremberg observed a youth, apparently about sixteen or seventeen years of age, dressed as a peasant, leaning against a wall in the market-place, and evidently in distress. But he was unable to give any account of himself; he could only utter, parrot-like, a few incoherent words, to the effect that he wanted to be a cavalry soldier. In his hand he bore a letter addressed to an officer in the town. The letter purported to be written by an illiterate workman, who said that the boy had been deposited at his door an infant by some one unknown, and that he had brought him up, but in strict seclusion. Enclosed in the letter was another, pretending to have been penned by the mother of the youth, but written by the same hand and at the same time, stating that she, a poor girl, had given birth to a babe on 30th April 1812, that his name was Kaspar, and that his father, then dead, had been a soldier. The youth's mind was totally blank, not from idiotcy, but because he had had no education whatever, and he was utterly ignorant of the commonest experiences of everyday life. His behaviour was that of a little child. He loathed all food except bread and water. The sounds, sights, and odours of the common world about him all caused him great pain. His senses were altogether unused to them, or rather they were such only as would be found in one who had lived without using them, or had lived as he had done in a state of complete darkness and complete solitude.

Some time afterwards, when his senses and his mind began to be schooled, he was able to give the following account of his former existence. As long as he could remember he had been in a hole or cage, too small for him to rest in any other posture than seated on the ground with his legs stretched straight out before him. His only clothing had been a pair of trousers and a shirt. He had never seen the sun nor heard sound of the outer world. Food—bread and water—was always supplied to him whilst he slept, and sometimes he was made to sleep by 'nasty stuff' (laudanum) put in the water. He had spent his time playing with two toy horses. He was attended to by 'a man,' who at last taught him to write a little, and to stand and to walk; and finally 'the man' had put shoes on his feet and had brought him to Nuremberg by night, and, placing the letter in his hand, had disappeared. The town authorities eventually decided to adopt this strange and forlorn being thus mysteriously brought to them. But about fifteen months later, on 17th October 1829, he was found bleeding from a wound in the forehead, which, he said, had been inflicted by 'the man.' But this individual could not be found, nor even any trace of him. Meanwhile attempts were being made to educate the untutored youth, and to civilise him. At first he showed a keen thirst for knowledge, marvellous powers of memory, and wonderful quickness in apprehension; but as his body began to grow rapidly, his mind, which had apparently been early checked in its growth, soon reached the full measure of its expansion and development. Crowds of the curious had at first flocked to see the strange boy, and visitors to the city still came to visit him. Amongst these was the eccentric Lord Stanhope, who conceived a sudden fancy for Kaspar and adopted him, sending him to Ansbach to be educated. But, as his mental development had suffered an arrest, so now his moral character began to deteriorate; and he was being gradually forgotten, when on 14th December 1833 he suddenly burst into the house, bleeding from a wound in his side, which he said had been dealt him by 'the man,' who on this occasion too could not be discovered. Three days later Kaspar Hauser died. Beyond these facts nothing more is known about him. Owing to the many inconsistencies in his story and the mystery surrounding him, many have regarded him as an artful impostor, and believe that he died an involuntary suicide. Others, again, looked upon him as the victim of a hideous crime, and believed that he was of noble birth, some indeed (since 1834) making him out to have been heir to the throne of Baden. But in 1875 the government of Baden

disproved the imputation by documentary evidence. See Eliz. G. Evans's monograph (1892).

Haussa, or Houssa, a people of the Soudan, who have been conquered by the Fulbe, and now constitute the larger part of the population in Sokoto, Adamawa, and Gando (q.v.). Whether they are of pure Negro race, or an immigrant wave of ancient Hamitic stock, now indistinguishable from the Negroes, is not yet fully determined. Their language is allied in its grammatical forms with the Hamitic tongues to the east and north, whilst its vocabulary resembles in many points that of the neighbouring Negro tribes. At any rate the Haussa language is the common medium of communication in the commercial world of central Soudan, and is spoken by 15,000,000 between the Mediterranean and the Gulf of Guinea. An association for the study of Haussa in England was founded in 1895. The Haussa themselves are keen traders, occupy themselves with agriculture and industrial pursuits, and are great slave-traders. They have adopted Islam from their conquerors. Many of them are employed as armed constabulary in the Gold Coast colonies. See Robinson's *Hausaland* (1896); Africa, Fulahs, Bornu, Kano.

Haussmann, George Eugene, who as prefect of the Seine did so much for the improvement and embellishment of Paris between 1853 and 1870, was born in that city on 27th March 1809. Entering the public service under Louis-Philippe, he distinguished himself in various parts of France, and under Napoleon III. rose to be prefect of the Seine (1853). Then it was that he began his task of improving the outward appearance of Paris by widening streets, laying out boulevards and parks, building sewers, barracks, bridges, and similar public works. For these great services he was made baron and senator. But the heavy financial burdens (£35,000,000) which these improvements laid upon the citizens was the cause of Haussmann's dismissal from office in 1870. In the following year he was, however, appointed director of the *Crédit Mobilier*, and in 1881 was elected a member of the Chamber of Deputies. 'Haussmannizing' has become a term for the reckless destruction of ancient buildings to make way for new streets. See his *Mémoires* by Havard (4 vols. 1890 *et seq.*). He died 11th January 1891.

Hautbois. See Oboe.

Haut Garonne. See Garonne (Haute).

Haut Rhin. See Belfort, Rhine.

Haüy, Rene Just, a French mineralogist, was born at St Just, department Oise, 28th February 1743, studied for the church, and took priest's orders. His attention was first turned to botany, and it was not until middle life that he commenced the study of mineralogy. He is the discoverer of the geometrical law of crystallisation, and he also considerably enriched our knowledge of pyro-electricity. After occupying several important posts, such as commissioner of weights and measures, curator of the cabinet of mines, and professor of mineralogy, he died on 3d June 1822. His most important works, besides an essay on crystals and a treatise on electricity, are *Traité de Minéralogie* (2 vols. 1801), *Traité Élémentaire de Physique* (2 vols. 1803), *Traité des Caractères Physiques des Pierres Précieuses* (1817), and *Traité de Cristallographie* (2 vols. 1822).—His brother Valentin Haüy (1745–1822) devoted his life to the education of the Blind (q.v.). He wrote *Essai sur l'Éducation des Aveugles* (1786).

Hauyne, a rock-forming mineral, having approximately the same composition as *Nosean*. The two are probably only varieties of one and the same mineral. They are anhydrous silicates of alumina and soda, or alumina and lime, with sodium and calcium sulphate. They crystallise in isometric forms, and have a hardness = 5–5·5, and a specific gravity = 2·2–2·5. Hauyne is usually bright blue to bluish-green, while Nosean is generally gray, but sometimes greenish or even dark brown. They are essentially of volcanic origin, occurring as constituents of many recent lavas.

Havana, or Havannah (properly 'San Christobal de la Habana'), the capital of the island of Cuba, and the principal centre of commerce in the West Indies, is situated on the north side of the island. Access is obtained to its magnificent well-sheltered harbour by a channel 350 yards wide, the entrance to which is defended by several forts. The streets of the older part of the town, which until 1863 was enclosed within walls, are narrow and dirty, and the harbour has been for generations polluted by the town sewage. With this older part the more modern portion lying to the west is connected by broad tree-shaded avenues and gardens. The houses, which are low, are solidly built of stone, have flat roofs, verandas, and barred windows reaching down to the ground, and are gay with paint and white marble decorations. The most noteworthy of the public buildings are the cathedral, built in the old Spanish style in 1724, whence the bones of Columbus (q.v.) were removed to Spain after the loss of the island in the war with the United States in 1898, and the hospital 'Beneficencia,' with orphan and lunatic asylums and a poorhouse. The public institutions include an arsenal, a botanical garden, a university, a technical school, and theatres. It is the seat of the governor of the island and of a bishop. Yellow fever is prevalent during the summer months. The population in 1897 was over 200,000. The staple industry of the place is cigar-making; sugar and tobacco are the staple products; molasses, rum, wax, and honey are also exported. Before the ruinous war of 1895–98 the exports had an annual value of £12,000,000, the imports of £10,000,000. The chief imports are rice, lard, flour, jerked beef, cod-fish, and coal. The United States take 90 per cent. of the exports, bring 20 per cent. of the imports, and provide vessels for one-third of the carrying trade. Another third of the vessels that enter Havana fly the Spanish flag, and the remaining third is divided between Holland, Great Britain, and France. Havana was originally founded on the south coast, near the modern Baracôa, by Diego Velasquez in 1515, but four years later was transferred to its present site. In the course of its unfortunate history it was burned to the ground by buccaneers in 1528, plundered by another band in 1555, and captured by a third in 1563, and again by the English in 1762. In the 17th century, however, it was made the chief emporium of Spanish trade in the West Indies and the point of rendezvous for the Spanish gold fleets.

Havant, a market-town of Hampshire, 8 miles NE. of Portsmouth. Tanning and matting are the chief industries. Pop. of parish, 3032.

Havas Agency, an organisation in Paris, founded by a rich merchant, Charles Havas, in the reign of Louis-Philippe, for the purpose of gathering telegraphic news and supplying it to newspapers. It was in 1879 converted into a company.

Havel, a tributary of the Elbe, which has its origin in a small lake in Mecklenburg, flows southward past Spandau to Potsdam, and thence west to Brandenburg, and finally north-west to its junction with the Elbe, opposite the town of Werben. It passes through several lakes and canals on its way. Its entire length is 220 miles; it is navigable to within 15 miles of its source; its drainage basin measures 10,160 sq. m. Its most

notable tributary is the Spree, on which Berlin stands.

Havelock, Sir Henry, one of the heroes of the Indian mutiny, was born April 5, 1795, at Bishop-Wearmouth, in Durham, where his father was a merchant and shipbuilder. He was educated at the Charterhouse, and was at first intended for the law, but, following his elder brother's example, entered the army a month after Waterloo, and went out to India in 1823. It was during the voyage that that conversion occurred which coloured all his after-life. Havelock distinguished himself in the Afghan and Sikh wars, but was still a lieutenant after 23 years' service. In 1856 he commanded a division of the army that invaded Persia. News of the Indian mutiny hastened his return to Calcutta, and ere long he had organised a small movable column at Allahabad with which to push on to the relief of the British at Cawnpore and Lucknow. A forced march brought his 2000 men to Fatehpur, where he engaged and broke the rebels. He continued his march upon Cawnpore, driving the enemy before him. The cowardly miscreants at the suggestion of the infamous Nana Sahib revenged their defeats before abandoning Cawnpore by the atrocious massacre of all the European women and children in their hands. At Ahirwa Havelock found the rebels strongly entrenched, but turned their left, and carried the village by a splendid charge of the 78th Highlanders. He now entered Cawnpore, and saw with his own eyes the horrors of the massacre. The sight steeled the hearts of his handful of heroes, who quitted Cawnpore to advance upon Lucknow. Crossing the Ganges, he repulsed the rebels at Unao, but after fighting eight victorious battles he found his little army so thinned by fatigue and sickness that he was reluctantly compelled to retire upon Cawnpore. Early in September General Outram arrived with reinforcements, and Havelock again advanced to the relief of Lucknow; Outram, with a chivalrous generosity characteristic of that heroic time, waiving his superior rank, and serving under Havelock as a volunteer until Lucknow was saved. The relieving force, which mustered 2500 men and 17 guns, after a sharp brush with the enemy engaged them at the Alum-Bagh, an isolated building about three miles from the Residency of Lucknow. Next with desperate bravery they fought their way through streets of houses, each a separate fortress, until they gained the Residency, to the indescribable joy of the beleaguered garrison. The victorious army were now in turn besieged, but held their own until November, when Sir Colin Campbell in his turn forced his way to their rescue. After the relief of Lucknow Havelock was attacked by dysentery, died November 22, 1857, and was buried in the Alum-Bagh. Before his death news arrived of his elevation to the distinction of K.C.B. Other honours were in store for him, but they came too late. He was made major-general; appointed to the colonelcy of the 3d Foot, and a baronet, with a proposed pension of £1000 a year. The rank and the pension were given to his widow, daughter of the Baptist missionary, Dr Marshman; a new patent of baronetcy issued in favour of the eldest son, as his father's was sealed only the day after his death; and a statue was erected by public subscription in Trafalgar Square. Havelock was strict in his religion, and severe in his discipline, somewhat after the type of the grave and fearless Puritans who fought and conquered under Cromwell. 'For more than forty years,' he said to Sir James Outram in his last moments, 'I have so ruled my life that when death came I might face it without fear.' This he did, and among her noblest soldiers England will never cease to remember the Christian hero, Sir Henry Havelock. See lives of him by W. Brock (1858), Miss Marshman (1860), and A. Forbes (1890).

Havelok the Dane. See the article on English Literature, Vol. IV. p. 367, and the edition of the romance by Professor Skeat (Early English Text Society, Extra Series, 1868).

Haven. See Harbour.

Haver, a term used in Scotch law to denote the person in whose custody a document is.

Haverfordwest (Welsh *Hwlffordd*), a parliamentary and municipal borough, seaport, and market-town of Wales, capital of the county of Pembroke, and a county of itself, occupies a picturesque situation on the river Cleddau, 10 miles NNE. of Milford by rail and 162 W. of Gloucester. A body of Flemings was settled in the district by Henry I. in 1107. The castle, the keep of which is now used as the county gaol, was erected by Gilbert de Clare, first Earl of Pembroke, in the 14th century. There are also remains of a 12th-century Augustinian priory. Paper-making is the chief industry. Since 1885 Haverfordwest has been included in the Pembroke boroughs, which return one member to the House of Commons. Pop. (1861) 7019; (1881) 6398; (1891) 6179.

Havergal, Frances Ridley, a popular hymn-writer, youngest child of Rev. W. H. Havergal, musical composer, and hon. canon of Worcester cathedral, was born 14th December 1836 at Astley, Worcestershire. A talented child, she familiarised herself with modern languages, tried Greek and Hebrew, and, developing her poetical gift, she gave utterance from time to time to many sweet and delicate religious strains of song. Her writings in poetry and prose have been popular with the religious public. Some of her hymns have found their way into church collections. She issued many such volumes as *Ministry of Song*, *Under the Surface*, &c. She died at Caswell Bay, Swansea, 3d June 1879. Her collected *Poetical Works* appeared in 1884, and her *Letters*, &c. in 1885. See *Memorials of Frances Ridley Havergal* (1880).

Haverhill, an ancient market-town in the south-west corner of Suffolk, 18 miles SE. of Cambridge. Pop. of parish, 3685.

Haverhill, a city of Massachusetts, at the head of navigation on the Merrimac River, 33 miles N. of Boston by rail. Its chief industry is the manufacture of boots and shoes, which employs about 6000 men in 200 factories; and there are manufactures also of iron, hats, glass, &c. Pop. (1870) 13,092; (1890) 27,412.

Havers, Clopton (1655–1702), anatomist and physician, after studying at Cambridge and Utrecht, where he graduated, settled in London in 1687. His *Osteologia Nova, or Some New Observations of the Bones and the Parts belonging to them* (Lond. 1691), was long a standard work; and his name is perpetuated as the discoverer of the Haversian canals in Bone (q.v.). Other details of his life are not known.

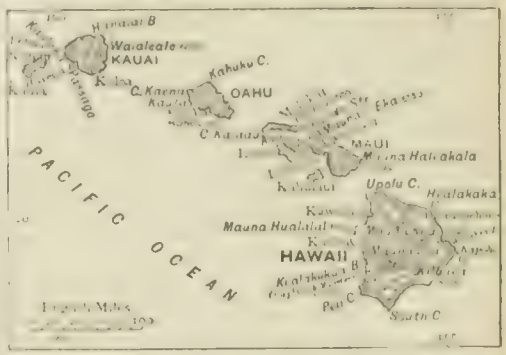
Havildar, the highest rank of non-commissioned officer among native troops in India and Ceylon.

Havre, Le (a contraction of the original name, Le Havre de Notre Dame de Grace), a seaport in the French department of Seine-Inférieure, and, next to Marseilles, the chief commercial emporium of the country, is situated on the north side of the estuary of the Seine, 143 miles NW. of Paris by rail. The port was entered in 1886 by 2580 vessels of 2,003,983 tons, and in 1888 by 2717 vessels of 2,341,023 tons, of which 1210 vessels of 825,892 tons were British and 645 vessels of 779,237 tons were French. These figures are

exclusive of 3112 (French) vessels of 379,777 tons and 3456 of 532,911 tons, in 1886 and 1888 respectively, engaged in the coasting trade. The chief imports are coals, wheat, cotton, dyewoods, coffee, hides, petroleum, wool, palm oil, alcohol, cocoa, and sugar. The exports consist principally of woollen and cotton goods, potatoes, salt, butter, paper, silks and ribbons, china ware, eggs, and ochre, in addition to 1½ million gallons of wine and nearly £280,000 worth of millinery. The customs duties levied amounted to £2,125,696 in 1888. Havre possesses excellent harbour accommodation, having nine separate dock basins (the ninth completed in 1887), with an area of 174 acres and 36,400 feet of quays. The port is very greatly handicapped in the struggle for commercial success by the paucity of railway connection and the height of the harbour dues. But the greatest drawback is the difficult approach to the harbour from the sea, owing to the shifting sandbanks that lie in the estuary. A very comprehensive scheme for improving the harbour and its approaches, and the lower course of the Seine, was put forward in 1889. It embraced the construction of a capacious outer harbour, protected by breakwaters, and provided with a new entrance from deep water, the building of protective dykes in the estuary, and very extensive dredging operations for the purpose of deepening the Seine up to Rouen. Meanwhile dredging is going on on a large scale just outside the harbour. Two new dry-docks were opened in 1889. Havre does not possess a fishing fleet. It is one of the chief ports in France from which emigrants set sail. The average of 30,000 rose in 1888 to 38,000, nearly one-third being French, with about the same number of Italians and one-fifth Swiss. Two-thirds were bound for the United States, the rest for the Argentine Republic. Amongst the local industries the first place is occupied by shipbuilding. Next come machine-factories, cannon-foundries, flour-mills, petroleum and sugar refineries, and dye-works. Havre has a hydrographical, an industrial, and a commercial-school, an influential chamber of commerce, and a tribunal of commerce. Its notable buildings include the 16th-century church of Notre Dame, a museum, a Renaissance town-house, a marine arsenal, &c. There are statues to Bernardin de St Pierre and Casimir Delavigne, both natives of Havre. The sanitary condition of the town is not so good as it should be. Nevertheless Havre is visited for its sea-bathing. Pop. (1876) 85,407; (1891) 116,369.

Down to 1516 Havre was only a fishing-village. Its history as a seaport dates from the reign of Francis I., who built the harbour and fortified it. Havre was held for some months in 1562 by the English, who were expelled by Charles IX. after a hot siege. Louis XIV. made it a strong citadel, and it was several times bombarded by the English in the 17th and 18th centuries. The town walls were demolished in the middle of the 19th century. Mdlle. de Scudéry was born at Havre. See histories by Morlent (1825) and Borély (1883).

Hawaii, Hawaiian Islands, or Sandwich Islands, a small archipelago in the North Pacific, till 1898 forming the kingdom of Hawaii (so called from Hawaii, the chief island of the group, and named Sandwich Islands by Captain Cook after Lord Sandwich, then First Lord of the Admiralty. The islands, twelve in number, form a rich, beautiful, and interesting chain which runs from south-east to north-west, and lies in 19° to 22° N. lat. and 155° to 160° W. long. Their total area is about 7000 sq. m., or about that of Wales. The names and areas of the eight principal islands (the other four being merely barren rocks) are as follows: Hawaii (the 'Owhyhee' of Captain Cook), 4210 sq. m.; Maui, 760; Oahu, 600; Kauai, 590; Molokai (the 'Lepers' Island'), 270; Lanai, 150; Kahulani, 63; Niihau, 97.



Hawaii is the southernmost of the group; it is in shape a rough triangle, with the apex pointing north-west.

Geography, Mountains, Rivers, &c.—The Hawaiian Islands are situated on the course of ships passing from San Francisco and Vancouver Island to China and Japan, as well as to New Zealand and Australia. They lie in mid-ocean, between the coasts of Asia and America, but are nearer to the American coast, from which they are about 2100 miles distant; they consequently form a convenient station for the coaling and repairing of vessels on their way across the Pacific. The islands are of volcanic origin, with coral-reefs partly lining most of them, but entirely encircling none. They suffer from want of good harbours, the best being the harbour of Honolulu, situated on the island of Oahu, with 22½ feet of water in its shallowest parts. This harbour, which is entered through a narrow channel in the reef, is the only really well-protected harbour in the group; during the time of the trade-winds, however, which blow from north-east to south-west for about nine months in the year, the roadsteads on the south shores of the islands afford safe anchorage almost anywhere. The larger islands are mountainous, and contain some of the largest volcanoes, both active and extinct, in the world. The two highest mountains, Mauna-Kea and Mauna-Loa, are in the island of Hawaii, and are 13,805 and 13,675 feet high respectively. This island is also traversed by other mountains, which give it a rugged and picturesque appearance, and in places bold cliffs from 1000 to 3000 feet high front the sea. Speaking generally, however, the high ground in each of the islands is in the centre, and the mountains are divided by rich valleys leading down to a sandy shore. On the eastern slope of Mauna-Loa, in Hawaii, is the far-famed Kilauea, the largest active volcano in the world. It is over 4000 feet above sea-level. Its crater is of oval shape, 9 miles in circumference, bounded by a range of cliffs, and containing within it a fiery lake of molten lava rising and falling like the waves of the sea. Mauna-Loa itself is an active volcano, the scene of various eruptions, notably of one in February 1877, when the glare caused by the fiery outburst is said to have been plainly visible on the island of Maui, 80 miles distant. On Maui is the crater of Haleakala ('house of the sun'), by far the largest known in the world. It is from 25 to 30 miles in circumference, from 2000 to 3000 feet deep, and is 10,032 feet above sea-level. Within this huge gulf are about sixteen basins of old volcanoes, whose ridges form concentric circles. Several of the islands, especially Hawaii and Kauai, are well supplied with rivers.

These afford great facilities for irrigation, but owing to the small size and the conformation of the islands they are in no case navigable.

Climate, Soil, &c.—Lying as they do in the middle of the Pacific Ocean, the Hawaiian Islands, though within the tropics, enjoy a fairly temperate climate. In the hot season the temperature seldom rises above 90° F., while in the cool season it seldom falls below 52° F., the average temperature for the year being 74·3° F. Rains, brought by the north-east trade-wind, are frequent on the side of the mountains which faces that quarter, but on the other parts of the islands little rain falls, and the sky is generally cloudless. The yearly rainfall at Honolulu, being on the leeward side of Oahu, is under 40 inches; that of the islands generally about 54 inches. The soil, whose constituent parts are mainly scoriæ, decomposed lava, and sand, is generally thin and poor, but at the bases of the mountains and in the valleys there are extensive tracts as fertile as they are beautiful. In Hawaii alone, on the Waimea plains, thousands of sheep of the merino breed find grazing ground; and on most of the islands, while the upland slopes of the mountains are clothed with dense forests, the lower levels spread into grassy plains rich with sugar and rice plantations.

Natural History, Products, &c.—The islands are separated from other lands by a broad expanse and great depth of sea, consequently their natural history has many special features of its own. In the high mountains there are some species of plants akin to those of the American continent. The forest-trees are mainly to be found on the windward, being the rainy side of the mountain-ranges. Tropical fruits are numerous. There are now, as has been stated, numerous sugar and rice plantations on the islands. The staple food of the natives consists of *poi*, a kind of thick paste made from the root of the *taro* plant (*Arum esculentum*) and raw or dried fish. The only indigenous animals are rats, mice, bats, dogs, and hogs, but others have been added since white men came to the islands; cattle, sheep, &c. having been introduced by Vancouver and other navigators. There are large numbers of semi-wild horses in the kingdom, and in some parts of the mountains wild dogs are also to be found. Reptiles are few, including on land one species of lizard and a few of the gecko; and the native birds, of which there were nineteen species, are rapidly disappearing, though foreign importations more than supply their place. The archipelago has unfortunately no mineral resources. Coral rock is the material chiefly used for building purposes, and to a less extent basalt, compact lava, and sandstone. There is a large variety of sea-shells, some of which are of exquisite beauty.

Trade, Finance, &c.—The commerce of the islands is gradually increasing. Up to the year 1876 the most important trade was that of the vessels engaged in the whale-fisheries of the Pacific, which now are almost extinct. In 1876 a Reciprocity Treaty was concluded with the United States, and since that date there has been an enormous development of the sugar export trade. Over 200,000,000 lb. of sugar, being eight-ninths of the total value of the exports, were grown and exported in some years, the other chief articles of export being rice, wool, molasses, coffee, hides, tallow, and bananas. The total value of produce exported from the islands ranges from $8,000,000 to $18,000,000 annually. The imports, which consist principally of dry-goods, reach about half that amount. Nine-tenths of the trade is with the United States. In the foreign carrying traffic some 300 vessels were employed in 1895, while about 60 Hawaiian ships ply between the different islands. On the larger islands there are good roads, and in the islands of Hawaii and Maui there are about 75 miles of railway, the first line having been opened in 1879. Telegraphs have been established in these two islands, and in Honolulu the telephone is in common use. The coins current in the islands are American dimes, quarter-dollars, half-dollars, and dollars. The estimated revenue of the kingdom fell between 1890 and 1895 from over $4,400,000 to under $3,700,000, the expenditure being calculated annually at a little less than the income. The chief sources of revenue are customs and internal taxes. The public debt in 1895 was $3,590,000.

History, Constitution, &c. The islands are said to have been discovered by Gaetano in 1542, and rediscovered by Captain Cook in the year 1778. Cook met his death at the hands of the natives in Kealakekua (Karakakoa) Bay in the year 1779. In early times each island had a king, but under Kamehameha I. the islands were formed into one kingdom. He died in 1819, and was succeeded by Liholiho, who adopted on his accession the name of Kamehameha II., and whose reign was famous for the abolition of idolatry simultaneously throughout all the islands. Vancouver, who arrived with Cook in 1778, and returned in 1792 and again in 1794, had made sincere attempts to enlighten the islanders, and succeeded so far that he was requested by the king and his chiefs to send out religious teachers to them from England. The first missionaries, however, who visited the islands came from the nearer shores of America. On their arrival in 1820 they witnessed the singular phenomenon of a nation without a religion. The instructions of Vancouver had, it would seem, not been forgotten, and had opened the eyes of the idol-worshipping natives to the grotesque absurdities of their system. But the spontaneous movement of 1819–20 'was no triumph of Christianity—for Christianity had not yet claimed or even approached the Hawaiian Islands.' The nation had voluntarily cast off the religion of their ancestors, and had not yet adopted—were not even acquainted with—any other system. The missionaries were well received, and the work of instruction was at once begun. In less than forty years they taught the whole Hawaiian people to read and write, to cipher and sew. Kamehameha II. and his queen visited England, and both died in London in July 1824. Prior to the year 1838 the government was a simple despotism, but in 1840 Kamehameha III. granted a constitution consisting of king, assembly of nobles, and representative council. In 1843 the independence of the Hawaiian kingdom was formally guaranteed by the French and English governments. Kamehameha IV. (1854–63) was succeeded by his brother Kamehameha V., with whose death in 1873 the line of the Kamehamehas became extinct, a high chief, Lunalilo, being elected to the vacant throne. On his death in 1874 another high chief, Kalakaua, was elected king. About 1886 the unsatisfactory state of the public finances under the existing system demanded some measure of reform, and in 1887 the king was called upon to dismiss his cabinet and constrained to grant a more popular constitution. In January 1893 the queen Liliuokalani, sister of Kalakaua I., who had reigned for two years, was dethroned by a revolution. Annexation to the United States failing through the opposition of President Cleveland, a Republic was inaugurated in 1894. In 1898, however, the islands were formally annexed to the United States, and in 1900 the territory of Hawaii was organised.

Population and Condition of the People. The total population of all the islands amounted in 1890 to 89,990, of whom 58,714 were males and 31,276 females. Of this total 34,436 were natives,

and among the foreign members of the community the most numerous element was the Chinese, numbering 15,301, mainly employed in working the sugar plantations; next to the Chinese, among foreign residents, came Portuguese, Americans, Germans, English, in the order given. The natives of the Hawaiian Archipelago belong to the brown Polynesian stock, and are akin to the New Zealand Maoris in race and language. They were once far more numerous than at present, having, it is said, at the time of Captain Cook's visit numbered probably some 200,000. There is no doubt that they have rapidly decreased, while the number of foreigners in the islands is continually increasing. Physically the Hawaiians are a remarkably fine and handsome race. In character they are indolent, joyous, and contented. The dress of the native men, where they have not adopted 'civilised' attire, consists merely of a wide strip of cloth round the loins, while the native women dress in a long ungirdled gown ('holoku') reaching from the neck to the ankles. Excellent day-schools have been established all over the islands, and there are very few natives who cannot read and write in their own language.

The decrease of the population is probably due in part at anyrate to the introduction of foreign diseases. At the present time, however, the disease most rife among the people is leprosy. It was not till the year 1865 that the Hawaiian government set aside the island of Molokai for the segregation of lepers in order to prevent to some extent the further spread of this terrible malady. Here they lived in a state of abject misery until the arrival of Father Damien (q.v.), whose work was taken up by others after his death in 1889. The prevention of leprosy is now attracting the serious attention of the Hawaiian government and their board of health; large numbers of lepers have been removed to the Molokai settlement, where over 1000 live.

See Mrs Bishop, *Six Months in the Sandwich Islands* (1875); Miss Gordon Cumming, *Fire Mountains* (1883); J. D. Dana, *Hawaiian Volcanoes* (1890); Sauvin, *Un Royaume Polynesien* (1893); Guillemard, *Malaysia and the Pacific Archipelagoes* (in Stanford's 'Compendium,' 2d ed. 1895); Staley, *Five Years' Church Work in Hawaii*; Manley Hopkins, *Hawaiian Islands*; Thrum, *Hawaiian Almanac and Annual*; the *Narrative of the Cruise of the Challenger*; the *Statesman's Year-book*, &c.

Hawarden (pronounced *Harden*), a small market-town of Flintshire, North Wales, 7 miles W. of Chester. There are some manufactures of tiles, pottery, &c. Lady Hamilton passed her girlhood here. The church, almost destroyed by fire in 1857, was restored from designs by Sir G. G. Scott. Hawarden Castle, Mr Gladstone's seat, dates from 1752. The park contains the ruined keep of a 13th-century castle commanding a fine view of the Dee. Pop. of parish, 7057.

Hawash, a river of Abyssinia (q.v.).

Hawes, STEPHEN, born probably in Suffolk, was groom of the chamber to Henry VII., and wrote, besides some half-dozen other works in prose and verse (now bibliographical rarities), *The Passetyme of Pleasure* (first printed by Wynkyn de Worde in 1509), a prolix poem not without fine stanzas, which doubtless helped to inspire Spenser. There have been reprints in 1831, 1845, &c. Hawes died probably in 1523.

Hawfinch (*Coccothraustes vulgaris*), a bird of the Grosbeak (q.v.) genus and the Finch family (Fringillidæ). It is considerably larger than the chaffinch; the adult male has the crown and back chestnut-brown, the neck and breast pale brown, the neck crossed at the back by a broad band of ash colour, wings partly black, greater wing-coverts grayish-white, lesser wing-coverts black or blackish-brown. The hawfinch is a very shy bird, perching on the topmost branches of trees, or on open boughs where it can command a good lookout, and avoiding man unless subdued by the effects of hunger or cold. It is gregarious. It feeds on the fruit of the hornbeam, plum, pine, cherry, laurel, holly, hawthorn, &c. It is not uncommon in some parts of England, but is rare in Scotland. It is widely distributed over Europe and the temperate parts of Asia, and is said to be found in Egypt.

Hawick, a manufacturing town of Roxburghshire, at the confluence of the Slitrig with the Teviot, 52 miles by rail SSE. of Edinburgh and 45 NNE. of Carlisle. Built in and round a hollow, with villas and mansions above, it is a place of hoar antiquity, but bears few traces thereof beyond the Moat, an artificial earthen mound 30 feet high and 312 in circumference, and part of the Tower Hotel, which, once the peel-tower of the Drumlanrig Douglases, and later a residence of Monmouth's widowed duchess, was the only building not burned by the Earl of Sussex in 1570. In the neighbourhood are Branxholm and Harden, old homes of the Scotts; and, older than either, there is the refrain of the June Common-riding song, 'Teribus ye Teri Odin,' which carries us back to days of heathendom. Else, all is modern—the handsome municipal building (1885); the churches, more than a dozen in number, and the oldest (1214) rebuilt in 1763; the splendid water-supply (1865–82); and the hosiery and tweed mills, to which, with dye-works, tanneries, &c., Hawick owes its prosperity. The hosiery manufacture dates from 1771, and that of shepherds' plaids, tweeds, blankets, &c. from 1830. The ancient municipal constitution of the burgh, based on a charter granted by Sir James Douglas of Drumlanrig in 1537, and confirmed by Queen Mary in 1545, was reformed by special act of parliament in 1861; and since 1867 Hawick, Selkirk, and Galashiels (the Border burghs) have returned one member. Pop. (1861) 10,401; (1881) 16,184; (1891) 19,204. See two works by James Wilson (1850–58), and Mrs Oliver's *Upper Teviotdale and the Scotts of Buccleuch* (1887).

Hawk, a name often given to almost all the Falconidæ, except the largest eagles, but also used in a more restricted sense to designate the Accipitrine section of the family, and for the most part referable either to the goshawks (Astur) or the sparrow-hawks (Accipiter). Unlike the true falcons, they have an untoothed bill. The wings are short, somewhat rounded, and very concave beneath, and while the flight is rapid it is without much power of soaring or gliding. See FALCONIDÆ, GOSHAWK, SPARROW HAWK.

Hawkbit (*Leontodon*), a genus of plants of weedy aspect belonging to the natural order Compositæ, closely related to and formerly united with Dandelion (q.v.), from which it has been separated on account of the feathery pappus. The name is due to the deep tooth-like lacerations of the leaves. Several species are natives of Britain, and these, along with a few others comprised in the genus, are widely distributed in Europe and Russian Asia.

Hawke, SIR EDWARD, LORD HAWKE OF TOWTON (1705–81), was the son of a lawyer of good middle-class stock. He was born in 1705 in London, and entered the navy while very young. The long quiet which followed the peace of Utrecht gave him no opportunity of seeing active service. He, however, attained the rank of commander in 1733. In 1744 he commanded the *Berwick* (70 guns) in the fleet under Admiral Mathews which was lying at Hyères Bay to watch the combined French and Spanish fleets in Toulon.

In the disgracefully-conducted battle of the 11th February of that year the *Berwick* was one of the few ships which were handled with spirit. Hawke followed his admiral in bearing down out of the line of battle to attack the Spanish ships which formed the rear of the allied fleet. This movement was considered irregular according to the pedantic tactical rules of the time, and, conjoined with his own violent conduct to his subordinate Lestock, proved ruinous to Admiral Mathews. But Hawke established his reputation as a daring officer. The Spanish line-of-battle ship, the *Poder*, the only vessel captured, surrendered to the *Berwick;* and it was not Hawke's fault that she was retaken by the enemy. In 1747 he was made rear-admiral of the white squadron, and the same year was despatched with a fleet of fourteen sail to intercept a French convoy of 252 merchant ships known to be leaving for the West Indies. On the 14th October Hawke caught the convoy off Cape Finisterre. It was guarded by a squadron of nine ships of war under M. L'Etenduère. The French admiral formed line of battle, and fought heroically to save his charge. The odds were great—fourteen English ships with 784 guns to nine French with 556—and after desperate fighting six of L'Etenduère's ships struck. But he saved his convoy, which fled during the battle. In the same year Hawke became member of parliament for Bristol. By 1755 he had attained the rank of full admiral. In the following year he was sent out to supersede the unhappy Byng, who had just disgraced himself and his country at Minorca. There was, however, nothing to do in the Mediterranean. During 1757 and 1758 he was in command in the Channel directing the naval half of the combined operations on the French coast sent out by the elder Pitt. His great feat—one of the greatest ever performed by a British admiral—came in 1759. During that year the French were preparing fleets at Brest and Rochefort to cover an invasion of England. The Brest fleet, the more powerful of the two, under the command of M. de Conflans, consisted of twenty ships carrying 1412 guns. It was watched by Hawke with a fleet of twenty-three ships carrying 1666 guns. On the 14th November the English fleet was driven off its station by a succession of furious gales, and M. de Conflans seized the chance to slip to sea. Hawke, who had anchored at Torbay, had, however, left lookout frigates, by whom he was informed of the sailing of the French admiral. Concluding at once that M. de Conflans would make for Rochefort, Hawke steered to cut him off at Quiberon. His calculation proved accurate. On the 20th November he caught the French, and, although it was blowing a fresh gale, attacked at once. The battle was one of the most heroic ever fought on sea. In a gale of wind, on the afternoon of a November day, and with one of the most terrible coasts in the world under his lee, Hawke forced on a close action. A famous story tells how his sailing-master expostulated at the order to take the flagship, the *Royal George* of 100 guns, into the dangerous Bay of Quiberon in such a gale and in the dark, and how Hawke replied: 'Mr Robinson, you have done your duty in pointing out the danger; you are now to obey my orders, and lay me alongside the French admiral.' The result was the destruction of the French fleet, and the collapse of the invasion scheme. It is curious that Hawke, who had been made a knight for the capture of L'Etenduère's squadron, did not receive the peerage this victory so well deserved till 1776, when he was made Baron Hawke of Towton. It is just possible that the freedom with which he rebuked the Admiralty for its management of the fleet may have had something to do with the delay. He was First Lord himself in the administration of 1765, but had no further chance of distinguished sea service. He died at Shepperton, Middlesex, 17th October 1781. See the excellent Life by Professor Captain Montagu Burrows (1883).

Hawker, Robert Stephen, the Cornish poet, was born at Plymouth, December 3, 1803. His father, then a physician, afterwards took orders; his grandfather, the Rev. Robert Hawker, D.D. (1753–1827), the author of the well-known *Morning and Evening Portions*, was for fifty years a vicar in Plymouth. He was a bright boy, notable especially for high spirits and an inveterate love for practical jokes. He had his education at Liskeard and Cheltenham grammar-school, and entered Pembroke College, Oxford, in 1823; but his father, now a curate, soon found himself unable to keep him at Oxford. Fortunately this difficulty was obviated by the lad's own marriage (November 1824) to a lady of some fortune. He was not yet twenty-one, while his wife, Miss Charlotte T'Ans, who had been his godmother, was forty-one. With her he returned to Oxford, migrating to Magdalen Hall. He carried off the Newdigate in 1827, took his B.A. in the following year, was ordained priest in 1831, and was presented by Bishop Phillpotts in 1834 to the vicarage of Morwenstow, a small village on the wild north Cornish coast, 6 miles N. of Bude Haven. Here he laboured with devotedness for forty years, lavishing charity from his slender means upon shipwrecked mariners and his own poor alike. There had been no resident vicar for a hundred years, the quaint old church and the vicarage were in ruins, and the parishioners were demoralised by generations of wrecking, smuggling, and spiritual ignorance. Hawker rebuilt his vicarage, restored his church, roofing it anew with shingles in spite of all advice and opposition; built and maintained a school; introduced the strange innovations of a weekly offertory and a harvest-thanksgiving, as well as a striking ceremonial largely of his own devising, and more often suggesting the usages of the Eastern than the Western Church. Yet he never felt any affinity with the modern Ritualists, but indeed he was in every sense a man difficult to class. His zeal was hot against Wesleyanism and every form of dissent, for his sympathies did not range wider than his knowledge. He himself shared many of the superstitions of his people, believing in the manifestations of spirits and in the influence of the evil eye. The spiritual world was very near and real to him: St Morwenna was no mere member of the choir invisible, but an influence that could still affect his everyday life. All his eccentricities were redeemed by his humanity, his humour, and his tender love for children and for animals. His manner in preaching is described as rapt and awe-inspiring; but his theology sadly lacked logic and consistency. The theologian cannot afford to allow his judgment to be dominated by fancy, but in poetry the case is altogether different. Here Hawker is absolutely delightful, with simple unsought pathos and exquisite imagery moulded into faultlessly graceful form. He has both the gifts of sweetness and sonority, and withal manly strength and vigorous phrase at will. His *Tendrils by Reuben*, published at seventeen, he had the good sense not to reprint; but by his Cornish ballads in *Records of the Western Shore* (1832; a second series in 1836) he stamped himself unmistakably a poet. These were republished in *Ecclesia* (1840); with some additions, as *Reeds shaken by the Wind* (1843; a second cluster in 1844); and yet again, along with *Genoveva*, in *Echoes of Old Cornwall* (1846). In 1869 he republished his earlier poems in *Cornish Ballads*, and the *Quest of the Sangreal*—the latter had already appeared in 1863. His *Footprints of Former Men*

in Cornwall, 1870) was a collection of miscellaneous papers on local traditions. None of Hawker's poems is better known than his spirited ballad based on the old Cornish refrain 'And shall Trelawney die?' which both Sir Walter Scott and Lord Macaulay took at first for a genuine antique.

Hawker's wife died in February 1863—a blow which drove him to melancholy and opium, from which he was saved only by his marriage (December 1864) to Miss Pauline Kuczynski, daughter of a Polish refugee by an English mother, and then a governess in a clerical friend's house. She bore him three daughters, and nursed his declining years with rare devotion. Hawker died at Plymouth, 15th August 1875, having been admitted less than twelve hours before to the Roman Catholic communion.

The biography by the Rev. S. Baring-Gould (1876; 4th ed. 1899), was severely attacked by some critics, and certainly contains irrelevances enough; much less satisfactory, however, is the *Memorials*, by the Rev. F. G. Lee (1876). A complete edition of Hawker's poems was edited in 1879, with a sensible short life, by his friend J. G. Godwin, who also edited his prose works (1893).

Hawkers, also called PEDLARS, or PETTY CHAPMEN, persons who go from town to town, or door to door, selling goods, wares, or merchandise, or exercising their skill in handicraft. A considerable change has been made by recent legislation in regard to this class. Those pedlars exercising their calling entirely on foot have been separately dealt with from hawkers who employ one or more beasts of burden in their business. The foot pedlars are placed under the surveillance of the police, and are exempt from excise duty. Under the Pedlars Act, 1871, any person whatever who can satisfy the chief officer of police of the police district in which he resides that he is of good character, is above seventeen years of age, and has resided during the previous month in the district, will receive, on due application, a certificate valid for a year, on payment of five shillings. The Pedlars Act, 1881, provides that such a certificate shall entitle the holder to exercise his calling in any part of the United Kingdom. The police have power at any time to open and search the packs, &c. of any certificated pedlar, with a view to prevent dishonesty and smuggling, &c., for which they have much opportunity. They have an appeal to the local Justice of Peace and other courts against oppression by the police.

Hawkers who use beasts of burden, and hawkers who go from place to place, hiring rooms or booths for the exhibition of their wares, are in a different category. The Hawkers Act, 1888, requires them to take out an annual or half-yearly license from the excise, which is valid all over the kingdom. These licenses are at the rate of £2 per annum; new licenses are granted only on a certificate of good character. A hawker is in no case entitled to sell spirits, but he may sell tea and coffee. He must not sell plated goods without taking out a plate license, nor must he sell by auction without an auctioneer's license. Any person hawking unprovided with a license, or who refuses to produce the license to any person who calls for it, is liable to penalties under the Act of 1888. Commercial travellers, book-agents, sellers of fruit, fish, victuals, or coal, also sellers in fairs or markets legally established, do not require either licenses or certificates, though it must be sometimes difficult to define whether a seller comes within the category of a pedlar or hawker.

In the United States hawkers are generally required to take out licenses, under the local laws of the several states, the charges of course varying. Moreover, in some states and territories, as Florida and Arizona, and in the District of Columbia, 'drummers' or commercial travellers must pay a license of from $25 to $200; while in Pennsylvania it is a misdemeanour to sell goods unless either the agent or his principal be a taxpayer of the state. But in many states no such law has ever been enacted, and in others, as in Montana and Nevada, similar acts, although on the statute-book, are held to be unconstitutional and are not enforced.

Hawke's Bay, a provincial district of New Zealand, on the east coast, between Auckland and Wellington. Area, 4765 sq. m.; pop. (1886) 24,568. It presents rich alluvial plains and undulating hills, with enormous forests. The bay known as Hawke's Bay was first entered by Captain Cook on 8th October 1769, and was so named after Sir Edward Hawke, then First Lord of the Admiralty. It is almost all suitable for farming, and the forests are of enormous extent. Napier (q.v.) is the port and chief city.

Hawkesbury, a river of New South Wales, rises in the Cullarin Range, and under the names of Wollondilly and Nepean flows NE., then turns as the Hawkesbury SE., and enters the Pacific at Broken Bay, about 20 miles NE. of Sydney. It has a total length of 330 miles, and is navigable for vessels of 100 tons as high as Windsor. The Hawkesbury is crossed by a steel girder bridge (1886–89) on the railway between Sydney and Newcastle. It carries a double line of rails, and is one of the largest structures of its kind in the world, having seven spans of from 410 to 416 feet, and a total length between abutments of 2900 feet. The bridge completes the system of railway communication between Brisbane and Adelaide.

Hawkesworth, JOHN, miscellaneous writer, was born in London, probably in 1715, but according to another account in 1719. Little is known of his early life, but he is said to have been apprenticed successively to a clockmaker and to an attorney; and for his education he was mainly indebted to his own perseverance. In 1744 he succeeded Dr Johnson on the *Gentleman's Magazine;* and in 1752 he started, with Johnson and others, a successful periodical called *The Adventurer*, half of whose 140 numbers were from Hawkesworth's own pen. As a reward for its services in the cause of morality he received from the Archbishop of Canterbury the degree of LL.D. He afterwards published a volume of fairy tales (1761), and an edition of Swift's works and letters, with a Life that Johnson praised highly; and he was chosen by Captain Cook to prepare the account of his first voyage, which formed vols. ii. and iii. of Hawkesworth's *Voyages* (3 vols. 1773), for which work the editor received £6000 from government. He died on 17th November 1773. Hawkesworth was too ardent an admirer of Johnson to attempt consciously to imitate him or to avoid doing so unconsciously. Yet his chief service to literature was that he introduced into the popular oriental fictions of the 18th century the ease of familiar writing, and so put an end to the long succession of dreary and bombastic narratives that strutted far behind in the track of *Rasselas*.

Hawking. See FALCONRY.

Hawkins, SIR JOHN, an English navigator, was born at Plymouth about 1532. He has the unhappy distinction of being the first Englishman that trafficked in slaves (1562). His 'commercial' career closed with his disastrous third voyage (1567), after which we find him more honourably employed. He was appointed treasurer of the navy in 1573, knighted for his services against the Spanish Armada in 1588, and for the rest of his life was engaged in making havoc of the Spanish West Indian trade. In 1595, along with his kinsman Drake, he commanded an expedition directed against the settlements in the Spanish Main, but

died at Porto Rico, November 21, in the same year. See Hakluyt's *Voyages* (iii.) and Purchas's *Pilgrimes* (iv.).

Hawkins, Sir John, author of the *History of Music*, was born at London, 30th March 1719, the son of a surveyor, and a descendant of the famous admiral. Bred an attorney, he acquired a fortune through his wife, and withdrew from professional work; and, becoming an active magistrate, was knighted for his services in connection with riots in 1768 and 1769. He collected a most valuable musical library, and after sixteen years of laborious research produced in 1776 his *General History of the Science and Practice of Music*, in 5 vols. quarto a work of admittedly great and accurate scholarship, somewhat unsystematic and tedious, and as a literary performance decidedly inferior to Burney's History (which began to appear at the same time). It was much abused and ridiculed, but is a work of permanent value, and was reprinted in 2 vols. in 1876. In 1760 Hawkins issued an edition of Walton's *Angler*. An original member of Dr Johnson's Ivy-lane Club, Hawkins became on Johnson's death his literary executor, and published in 1787 a *Life of Dr Johnson* and an edition of his works. He died 21st May 1789.—His son, John Sidney, published a history of Gothic architecture; his daughter, Lætitia, her own *Memoirs*, with many anecdotes of Dr Johnson.

Hawk-moth (*Sphingidæ*), a family of lepidopterous insects, forming along with the clear-winged moths (Ægeriidæ) and the burnets and foresters (Zygænidæ) the tribe Sphinges. They have stout bodies, large heads with prominent eyes, and stout short antennæ. The wings are long, narrow, more or less pointed, and have always a retinaculum. They are insects generally of rapid flight, and fly about in the twilight; some species also during the day. Their caterpillars are sixteen-legged, flat, smooth, often green, with transverse stripes on the sides and nearly always a horn on the back of the second last segment. They change to pupæ either on the surface of the ground or in a cell underground which they form for the purpose. The common species of the Humming-bird Hawk-moth (*Macroglossa stellatarum*) in Britain has brown fore wings and reddish tawny hind wings, and, unlike all other hawk-moths except the Bee Hawk-moths (*Hemaris* or *Sesia fuciformis* and *bombyliformis*), has a spreading tuft of hairs at the end of the body. Most of the foreign species are similarly coloured; and some of the South American species resemble humming-birds so closely that they cannot on the wing be distinguished from them, the natives there and even educated whites firmly believing that the one is transmutable into the other. Smerinthus is the only genus of the British hawk-moth with dentated wings. One of the most remarkable hawk-moths is the Death's-head (q.v.) (*Acherontia atropos*), the largest moth found in Britain. It sometimes measures nearly six inches across the wings; the fore wings are brown, the hind wings pale brown with black bands; and on the back of the thorax is a pattern in gray and black having a certain resemblance to a skull. The Privet Hawk-moth (*Sphinx ligustri*), the type of the family, measures about four inches across the fore wings, which are of a pale brown colour with darker markings; the hind wings are pale pink crossed by three black bands. Its green caterpillar, with white and lilac streaks on the sides and a black horn on the back, feeds on privet and lilac, and the position it assumes when resting suggested that of the mythological Sphinx to the old naturalists, who applied this name to the insect.

Caterpillar of Humming-bird Hawk-moth (*Macroglossa stellatarum*).

Humming-bird and Humming-bird Hawk-moth (*Macroglossa stellatarum*) (after Bates).

Hawks, Francis Lister, an American clergyman, born at New Berne, North Carolina, 10th June 1798, practised law for a time with success, but in 1827 was ordained to the Episcopal ministry. He was professor of Divinity at Washington (now Trinity) College, Hartford, in 1830–31, and afterwards rector of churches in New York, New Orleans, and Baltimore. He died in New York, September 26, 1866. In 1836 he went to England, and there obtained 18 folio vols. of MSS. relating to the Episcopal Church in America, of which he had been appointed historiographer. In 1836–39 he published 2 vols. of *Contributions to the Ecclesiastical History of the United States*, dealing with Virginia and Maryland. Among his other works are a *Commentary on the Constitution and Canons* (1841), and, with Bishop Perry, *Documentary History of the Protestant Episcopal Church* (vols. i. and ii. 1863–64); and he edited Alexander Hamilton's state-papers (1842), Commodore Perry's *Expedition to Japan* (1852–54), and Appleton's *Cyclopædia of Biography* (1856).

Hawksbeard (*Crepis*), a genus of annual and biennial plants belonging to the natural order Compositæ, so closely related to Hawkweed (Hieracium) that some of the species are referred to the one genus or the other according to the peculiar views of individual botanists. The species are widely distributed through Europe and Asia.

Hawksbee, or Hauksbee, Francis, physicist, was already a well-known experimentalist when in 1705 he was admitted a Fellow of the Royal Society, and he died soon after 1713. (Not to be confused with him is Francis Hawksbee the younger, 1687–1763, apparently his son, who was also an electrician and skilled instrument-maker, and was in 1723 appointed clerk and housekeeper to the Royal Society.) Hawksbee the elder carried further the tentative observations by Dr Gilbert and Boyle on the subject of electricity, and by his experiments laid the scientific foundations of that branch of knowledge. He contributed forty three memoirs to the *Philosophical Transactions*, chiefly on chemistry and electricity, between 1704 and 1713. His chief independent work, published in 1709, was entitled *Physico-Mechanical Experiments on various Subjects, touching Light and Electricity, producible on the Attrition of Bodies*. He is also well known as the improver of the earlier air-pumps

of Boyle, Papin, and Hooke, and as the first who used glass in the electrical machine.

Hawkweed (*Hieracium*), a genus of plants of the natural order Compositæ, sub-order Cichoraceæ. The species are perennial herbs of no popular interest with the exception of the Orange Hawkweed (*H. aurantiacum*), a native of the south of Europe, which on account of its handsome orange flowers is frequently cultivated in gardens. The popular name is founded on an ancient belief that birds of prey used the juice of the species to strengthen their vision. The English name *Hawkweed*, the German *Habichts-kraut*, and the French *Épervière* all testify to this curious belief having been formerly universally entertained.

Orange Hawkweed (*Hieracium aurantiacum*).

Hawkwood, SIR JOHN, Italianised L'ACUTO or L'AGUTO, an English captain who won great renown and much riches as a condottiere in Italy in the wars of the 14th century, was the son of a well-to-do tanner of Sible Hedingham, in Essex. Having embraced the calling of arms, he distinguished himself at the battles of Crécy and Poitiers, thereby winning the favour of the Black Prince; he was knighted by Edward III. After peace was signed at Bretigny (1360) he gathered a band of mercenary soldiers and led them to Italy, where he at first took service with Pisa against Florence. Then, after fighting in most of the petty Italian wars of the period, notably for the Visconti and for Pope Gregory XI., he agreed to fight the battles of Florence in return for an annual pension. His last years were spent in the neighbourhood of Florence, and there he died in 1394, and was honoured with a magnificent public funeral. See Nichol's *Bibl. Topog. Brit.*, vol. vi.; Temple Leader and Marcotti's *Life* (Eng. trans. by Mrs Leader Scott, 1889); and *Quarterly Review* (Jan. 1890).

Haworth, a moorland village in the West Riding of Yorkshire, 4 miles SSW. of Keighley by a branch-line. The old church has been ruthlessly demolished, but in the churchyard are the graves of Charlotte and Emily Brontë. Pop. 3816. See *Haworth, Past and Present* (Bradford, 1889).

Hawse (akin to Icel. *hals*, 'the neck'), part of a vessel's bow, in which the *hawse-holes* are cut. Through the hawse-holes the cables pass which hold a vessel when she is moored with two anchors out forward—one on the starboard, the other on the port bow.—*Hawser* is a small cable or a large rope.

Hawthorn (*Crataegus oxyacantha*: see CRATÆGUS), a shrub or small tree, a native of Europe, Siberia, and the north of Africa, common in Britain, and much planted both for hedges and for ornament. It varies in height from 6 or 8 to 20 or 25 feet. It has roundish obovate three- to five-lobed deciduous leaves, and corymbs, generally of white, rose-coloured or sometimes deep crimson flowers, succeeded by a small red fruit (*haws*) with yellow pulp, the central stony part bearing a very large proportion to the pulp. There are many varieties of hawthorn, and, curiously enough, some have only one style, whilst some have several. The variety called Glastonbury Thorn—because supposed to have originated at Glastonbury (q.v.)—is remarkable for its early flowering, which often takes place in the middle of winter, whilst the common kind is not in flower till May or June. The winter flowers of the Glastonbury variety are, however, not generally followed by fruit, and a second flowering often takes place in the same year. The common hawthorn is often popularly called *May*, from the season of its flowering in England. It is also called *Whitethorn*, in contradistinction to the Sloe or Blackthorn. The perfume of the blossoms is strong but delicious. The use of the hawthorn for hedges is almost universal in Britain. It has also sometimes been employed as a stock on which to graft apples and other Pomaceæ. Several double-flowered and select single-flowered varieties are propagated by budding and grafting for the adornment of lawns and pleasure-grounds. A fermented liquor, which is very intoxicating, is made from the fruit in many parts of France. For the Cockspur Thorn of North America, and the Pyracanth Thorn, see CRATÆGUS.

The hawthorn is particularly valuable as a hedge-plant, in consequence of its strong and plentiful spines, its long life, and its ready adaptation to very various soils. For this purpose it is propagated by seed: the haws are laid in a heap to rot, with a mixture of sand or fine mould, and, in a year or sixteen months after, the seeds are sown in ground carefully prepared. The young plants are kept clear of weeds, and often grow to the height of a foot or two feet in the first season (see HEDGE). Hawthorn hedges bear trimming very well. Young hawthorn plants are called *quicks* or *quicksets*, because used to make living (*quick*) fences.

An old English tradition regards Christ's crown of thorns as made of hawthorn; for the same reason the French call it 'l'épine noble.' In south Germany the tradition pointed to blackthorn, as elsewhere to some kind of buckthorn. Whitethorn was much favoured by fairies, old and lonely thorn-trees being regarded as their trysting-places.

Hawthorne, NATHANIEL, American author, born July 4, 1804, at Salem, Massachusetts. He was descended from English Separatist stock, and the character of his ancestry seems to have made an early and enduring impression on his thoughts. This impression did not lead him to follow out and exemplify in his own career their modes of action, but rather caused him to turn and reflect upon the nature of his predecessors and the conditions amid which they lived. Probably we owe to this inclination the singular interest and penetrating quality of vividness with which he imbued his scenes from early New England life; and the intensity of concentration which he applied in dealing with moral problems in his romances reveals in him the character of the modernised Puritan. The first American Hawthorne (or, as the name was then spelled, Hathorne) was William, who migrated from England (Wiltshire?), in 1630, to Salem in New England, where he became a leader of the colonial soldiery and a magistrate, distinguished for both bravery and eloquence. 'The figure of that first ancestor,' wrote Hawthorne, in his sketch of The Custom-house, 'invested by family tradition with a dim and dusky grandeur, was present to my boyish imagination as far back as I can remember.' William Hawthorne took part in the persecution

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of the Quakers. His son John, also a military officer and magistrate, presided at the famous trials of the Salem witchcraft cases. Daniel, the author's grandfather, was a member of an American regiment, and also commanded a privateer, in the war of the Revolution against Great Britain.

Daniel's son Nathaniel, 'a silent, reserved, severe man, of an athletic and rather slender build, and habitually of a rather melancholy cast of thought,' became a captain in the merchant marine; the family having suffered a decline of fortune, and the male members mostly following the sea. He died when his son Nathaniel, the subject of this article, was but four years old. His widow, a woman of great refinement and religious sensibility, lived always afterwards in close retirement and straitened circumstances, with her two daughters and her son Nathaniel, who, from his ninth to his thirteenth year, was somewhat confined by an accidental lameness. His intense love of reading was doubtless fostered by these conditions. At fourteen he went with his mother to a lonely farm in the woods of Raymond, Maine; forming there, as he thought, that habit of solitude which became one of his permanent traits, but was probably inherited in part from his father. He was, however, a healthy, happy lad, given to outdoor sports and exercise, and quite free from morbidness in spite of his fondness for solitude. In Raymond he began to keep note-books, recording his observations; a practice which he resumed in later life and continued through the greater part of his career. At Bowdoin College, where he graduated in the class of 1825, with the poet Longfellow, he took a good rank, and gave pronounced signs of his tendency to authorship, having begun his first novel during his undergraduate course. But the conditions in the United States were at that period unfavourable to authorship as a profession, and his progress was slow. After his return to Salem he shut himself up for twelve years 'in a heavy seclusion,' writing tales and verses. Of the latter few have survived. In 1828 he published anonymously his first novel, *Fanshawe*, which was unsuccessful. Continuing to contribute to annuals and magazines, under various pseudonyms that made it still more difficult for him to become known, he edited in 1836 a short-lived periodical for S. G. Goodrich, for whom also he wrote *Peter Parley's Universal History*, an enormously profitable publication, of which Goodrich figured as the author and took the proceeds, while Hawthorne received only one hundred dollars.

Meanwhile some of his short fictions had gained such favourable notice from the London *Athenæum* that in 1837 a group of them, to which he gave the name *Twice-told Tales*, was issued in one volume, the risk of which was assumed, without the knowledge of Hawthorne, by his friend and classmate, H. N. Bridge. This book, which an impartial and competent critic has said 'marked a distinct epoch in American literature,' was reviewed with high praise by Longfellow, and substantially made the beginning of Hawthorne's fame. Yet he still had long to wait for its fulfilment. The full force of the new author's genius was by no means appreciated in his own country; and diligent though he was with his pen, he was still unable to live by it. In January 1839 the historian Bancroft, then collector of the port of Boston, appointed him weigher and gauger in the custom-house, which post he held until early in 1841. In April he allied himself with an industrial association at Brook Farm (q.v.), near Boston, founded by Dr George Ripley (afterwards a distinguished critic), with a number of highly cultivated men and women, among whom were George William Curtis, Charles A. Dana, and Margaret Fuller. The object was to establish an idyllic, semi-socialistic community, in which every member should do manual labour and share profits in common, while carrying on his or her chosen intellectual work, and maintaining in the community a separate single or family life. Hawthorne, who was about to marry, had some hope of making his home here, but finding the experiment unsatisfactory he withdrew. Meanwhile he wrote and published in three parts a series of simple stories for children, from New England history—viz. *Grandfather's Chair*, *Famous Old People*, and *Liberty Tree* (1841). In July 1842 he wedded Sophia Amelia Peabody, of Salem, his union with whom became one of the rarest and most beautiful chapters in the annals of happy marriages. No account of Hawthorne would be complete which failed to lay stress upon his marriage to this lady, who, as their son Julian has written, 'was a blessing and an illumination wherever she went; and no one ever knew her without receiving from her far more than could be given in return.'

Removing to Concord, Massachusetts, he issued *Biographical Stories* (1842) for children, brought out an enlarged two-volume edition of the *Twice-told Tales* (1842), and lived for four years in the old colonial manse, previously occupied by the ancestors of Ralph Waldo Emerson, and by Emerson himself, overlooking the field of the first battle of the Revolution. Here he dwelt happily, preserving his old custom of comparative isolation, and, seeing but little of his famous neighbours Emerson and Thoreau. He wrote many sketches and studies for the *Democratic Review*. These formed the *Mosses from an Old Manse* (1846). But he was poorly paid, or not at all. The *Review* failed; and, as he had lost all his previous savings invested at Brook Farm, he was forced to leave this home, and accept a place in the custom-house again—this time as surveyor, in his native town, Salem. The place was uncongenial, and for nearly four years he remained silent as an author. But by the expiration of his term he had completed (February 1850) *The Scarlet Letter*, which at once gained great renown, and still remains perhaps the best known of his works. It did not, however, bring him pecuniary ease. Hiring a small house at Lenox, Massachusetts, he entered upon a phase of remarkable productivity, showing that he had needed only encouragement and recognition to bring his powers into full play. At Lenox he wrote *The House of the Seven Gables* (1851), which added to his celebrity and popularity; also *The Wonder Book*, a recast of classic legends for children (1851); and prepared *The Snow Image*, which was not published until 1852. In the winter he wrote at West Newton *The Blithedale Romance*, which incidentally drew colouring from the Brook Farm episode, though in no way attempting to depict it as a fact. Having bought at Concord a small house, which he christened 'The Wayside,' he settled there in the summer of 1852, and wrote a Life of General Franklin Pierce, his old college friend, who had been nominated for the presidency of the United States. Immediately afterwards he completed *Tanglewood Tales*, a continuation of *The Wonder Book*; but this appeared first in 1853.

Pierce, on his inauguration as president in March 1853, named Hawthorne to be consul at Liverpool, a lucrative office which his experience in the custom-house qualified him to fill. The appointment was confirmed by the senate; and although Hawthorne had resolved to accept nothing from the president, and much persuasion had to be used to change his mind, he finally took the appointment, and sailed for Liverpool, midsummer, 1853. He held the consulate until near the close of 1857, attending closely to his duties, but spending part of the time in London, and visiting various portions

of England and Scotland. A sojourn of a year and a half in Rome and Florence, beginning January 1858, supplied him with the materials for a new romance, *The Marble Faun*, better known in England as *Transformation*, which he wrote at Redcar, Yorkshire, in the autumn of 1859, and published in 1860. In June of this year he returned to Concord, where approaching ill-health, and the mental depression caused by the outbreak of civil war in the United States, impeded his efforts at literary composition. He wrote, however, a number of brilliant papers embodying observations and experiences in England, which were printed in the *Atlantic Monthly*, and then issued in the volume *Our Old Home* (1863). He also began a new romance, founded on the idea of an elixir of immortality. It remained unfinished at his death, which occurred in the night of May 18, 1864, at Plymouth, New Hampshire, whither he had gone on a journey in search of health, with his friend ex-president Pierce. He was buried at Concord, Massachusetts, May 24, in a spot near which are the graves of Emerson and Thoreau.

In his style he early developed that maturity of dignified composure, free from constraint or affectation, and that lucid expression, which are among its most characteristic traits. With little faculty for the harmonies of verse, he had a singular command over the musical qualities of prose, enabling him to produce periods remarkable for their sonorous richness and delicate cadences, that sometimes raise them almost to the plane of poetry, yet never destroy their character as prose by interpreting the actual rhythms of verse. Although exceptionally fitted for conveying subtleties of thought and fantasy, his style is equally adapted to the comprehension of children, being invariably clear, and strongly marked by common sense. Another noticeable peculiarity is that, in the entire range of his writings, quotation is almost never resorted to: the author's mind being apparently so self-centred that its originality felt no need of aid or illustration from other writers. The superlative merits of Hawthorne's style were but slowly recognised in his own country; but his fame has rapidly and steadily increased since his death. Several of his works have been translated into foreign languages; and he is now generally esteemed as one of the greatest imaginative minds of the century, holding a place in the first rank among masters of modern English prose.

The personal appearance of Hawthorne was tall, vigorous, and commanding. Powerful physically, and in every way a strong specimen of manhood, he yet in his manner and presence showed the gentleness of a woman. His intimates were few, but with them he was a genial comrade, as he was also a delightful companion in his household. The union in him of strength and sensitiveness has been well described by James Russell Lowell:

> Far be from sympathetic soul he kept apart
> Beneath a veil, over-fragrance of heart
> Nor [illegible] soul reserved and deep
> [illegible] with a [illegible] of May

The best extant portraits of Hawthorne are the photographs taken by Mayall of London in May 1860. One of these was engraved in *Harpers' Magazine* for July 1886; another in the *Century Magazine* for May 1887.

A preliminary version of the unfinished romance was edited by his daughter Una, his eldest child, with the aid of Robert Browning, and was published under the title of *Septimius Felton* (1872). Another version, edited by his son Julian, appeared as *Dr Grimshawe's Secret* (1883). Both these forms had been abandoned by the author, who left us, MS. portions of the work as he meant to complete it, *The Dolliver Romance* (1876). His widow (who died in London, February 26, 1871) edited and published his *American Notebooks* (1868), *English Notebooks* (1870), and *French and Italian Note-books* (1871); besides bringing out a volume of her own *Notes in England and Italy* (1868). George Parsons Lathrop, who married Hawthorne's younger daughter Rose, published *A Study of Hawthorne* (1876), containing many biographical details, and edited the Riverside edition of the complete works, with notes and a sketch of the author's life (11 vols. 1883). Rose, the second daughter and youngest child (born in 1851, married 1871), has also made numerous contributions to periodicals in prose and verse, and published in 1888 a volume of poems entitled *Along the Shore*. Una, the eldest child, born in 1844, died in London in 1877. Julian Hawthorne issued a complete memoir of his father, *Nathaniel Hawthorne and his Wife* (2 vols. 1885). Henry James, junior, published a brilliant but unsympathetic monograph on Hawthorne (1879); James Russell Lowell a short life (1890); and Moncure Conway one in 1890. See also the *Personal Recollections* of Horatio Bridge (1893).

JULIAN HAWTHORNE, his son, was born at Boston, Massachusetts, June 22, 1846. After his studies at Harvard he devoted himself to engineering at Dresden; next worked under General M'Clellan in the New York Docks, returning to Dresden to pursue a life of letters, continued later in London (1875–82) and in New York. He subsequently settled on a Jamaica farm. His first novels, *Bressant* (1873) and *Idolatry* (1874), were well followed by *Garth* (1875), *Sebastian Strome* (1880), *Fortune's Fool* (1883), and *Dust* (1884); and, not so well, by an innumerable series of shorter stories, some—not over good—of the detective class, such as *David Poindexter's Disappearance* (1888) and *Section 558: or The Fatal Letter* (1888).

Hay (from the same root as *hew*, *hoe*), the stems and leaves of grasses or other plants dried for Fodder (q.v.) of cattle. Throughout the grazing and dairy districts of Ireland and England a large breadth of old pasture is annually cut. In Scotland, however, little of this old natural grass is converted into hay, and the crop consists mainly of clover and sown grasses in which ryegrass bulks largely. This requires less turning and labour than the closer succulent natural grasses, and with twice turning, and a week or ten days' drying, will generally be fit for the rick, into which the English farmer at once places it. In Scotland the weather is seldom sufficiently fine to fit the hay, within a moderate time, for a large rick, and the practice here, as in the moister parts of England and in Ireland, is to put it, after a few days, into *cocks*, containing one or two hundredweight, and thence, after another week, into what are technically called tramp-ricks, containing from one to two tons. From these it is transferred at any convenient time to the rick-yard. This practice, although very prevalent in the north, is attended with loss of time and labour, and, moreover, bleaches and dries up the hay, giving it the appearance of straw, and preventing that gentle heating which English farmers desire both in their clover and grass hay. In the United States timothy is the best haymaking grass; next come redtop, orchard-grass, and blue-grass or June-grass.

The management of the natural grasses of which most English hay consists is somewhat different, and the process is seen in perfection in Middlesex and various of the counties about London. The great matter—too generally overlooked in Scotland—is to preserve the colour and flavour of the grass. This may be done by frequent turning, so as to have it rapidly dried, and if possible without the deteriorating washing of repeated rains. Artificial drying best attains this end, but is of course impracticable on the large scale. In the best style of English haymaking the grass, after being cut with the scythe or machine, and as soon as the dew is off, is shaken and spread out by means of forks or of a *tedding*-machine drawn by a horse.

it is not allowed to lie long exposed to the sun, but before evening is drawn together by rakes into *wind-rows*, which, if there is any prospect of rain, are made up into small heaps or cocks. It is again spread out next morning, or on the return of favourable weather; and when the operations are expedited by wind and sun, the hay will be ready for the rick by the second or third day. There is, however, much difference in the time during which the hay requires to lie out; the bulk of the crop and the quality of the land must be especially considered. When the grasses are cut in bloom, as they should be, and before their seed ripens and their stems get tough and hard, they contain the largest amount of moisture, and require careful making, but produce then the most nutritive and palatable hay. As soon as it is thoroughly dry it should be put at once into the stack or rick, and well trodden down. A certain amount of heating improves the flavour, and renders the hay more palatable to every kind of stock. When, as is sometimes the case, it is imperfectly made, or picked up too soon, it gets overheated, and becomes dark brown or black, while its nutritive properties are diminished; it is, moreover, apt to disagree with both horses and cattle, and can be profitably used only when mixed with straw and cut into chaff. Indeed it has been proved by experiments that hay may be so damaged by bad weather in the process of making as to be unable to maintain, not to speak of increasing, the condition of animals fed upon it. Hay put together when damp from rain or dew does not heat, as it does when it contains an undue amount of natural moisture, but speedily moulds. When hay has been weathered and injured by repeated rains, it may be rendered more palatable by scattering a little common salt or specially prepared spice over the rick whilst it is being built. In Scotland, eight or ten pounds of salt to the ton is used alike for the clover and grass hay. In mid and southern England the best hay is generally got up in June, in Scotland not until the middle of July. The crop averages from one to two tons per acre. Hay that has stood for seed is tougher and less nutritive than that cut earlier, for the sugar, gum, and gluten of the matured seed have been abstracted from the stems. See also SILAGE.

Hay, JOHN, an American author, was born at Salem, Indiana, 8th October 1838, graduated at Brown University in 1858, and was admitted to the Illinois bar in 1861. Almost immediately after he became assistant private secretary to President Lincoln; and during the war he served for some months in the field, retiring with the brevet of colonel. He was afterwards first secretary of legation at Paris (1865–67) and Madrid (1868–70), and *chargé d'affaires* at Vienna (1867–68); and in 1870–75 he was on the staff of the *New York Tribune*. In 1879–81 he was first assistant-secretary of state. His *Pike County Ballads* (1871) include 'Little Breeches' and 'Jim Bludso;' he has also published *Castilian Days*, and, with J. G. Nicolay, a Life of Lincoln (1891). In 1897 he was United States ambassador to Britain, from 1898 secretary of state to President McKinley.

Hayden, FERDINAND VANDEVEER, LL.D., geologist, was born at Westfield, Massachusetts, 7th September 1829, studied at the Albany medical college, and during the greater part of 1853–62 was employed in surveys in the north-west. He served as surgeon in the Union army during the war, and filled the chair of Mineralogy and Geology in the University of Pennsylvania from 1865 to 1872. In 1867–69 he carried out the geological survey of Nebraska, and afterwards was director of the geological survey of the territories of the United States, until in 1879 the various national surveys were combined in the geological survey of the United States. Till 1886 Dr Hayden remained at the head of the Montana division. He died 18th January 1888. He published many papers, besides numerous and valuable government reports.

Haydn, JOSEPH, a German composer, was born at the village of Rohrau, on the confines of Hungary and Austria, 1st April 1732. He was the son of a poor wheelwright; and manifesting great musical talent, he was received at the age of eight into the choir of the cathedral of St Stephen's, at Vienna. Here he remained till his eighteenth year, acquiring a practical rather than a theoretical knowledge of his art, by singing the music of the best Italian and German religious composers. In that year, however, his voice broke, and he lost his place as a chorister. He wandered about the streets of Vienna, and earned a precarious livelihood by playing the violin in serenading parties and at dances. A charitable singer offered him a lodging, which for a short while he availed himself of. Ultimately, by the exercise of great thrift, he was enabled to hire an attic and a piano; then he devoted all his leisure time to study. He bought by accident the six sonatas of C. P. E. Bach at a cheap bookstall, and the indefatigable study of them revealed to him the possibility of new form in music—form which should be the reaction against the old contrapuntal style of J. S. Bach and Handel, and which it became thenceforward his mission to inaugurate. The main essentials of this reaction were the abandonment of the fugue form as the basis of musical composition, and the substitution in its room of two free melodies as themes for treatment, not necessarily constructed in double counterpoint to one another. During this period of assiduous study Haydn still kept up his connection with the serenaders and dance-players of Vienna, for whom he often now wrote the music. One evening as he was playing a serenade of his composition, along with other instrumentalists, under the window of Frau Kurz, the wife of the theatrical manager of that name, her husband was very much struck by the music, and calling Haydn up, commissioned him to write an opera as melodious as the serenade. This was the beginning of his fortunes. His opera made him acquainted with the poet Metastasio, at that time a tutor in Vienna, by whom he was introduced to the composer Porpora, and enabled to remedy the deficiencies of an education principally obtained hitherto through private study.

In the later part of 1759 he composed his first quartet for stringed instruments. In 1759 Count Morzin engaged him as capellmeister. For Count Morzin's orchestra Haydn wrote his First Symphony in D. The once obscure musician was now a popular music-master in Vienna. He married at this time Maria Anna Keller, the daughter of a wig-maker, who had been kind to him in his days of penury. This union did not prove a happy one. The circumstances of it were singular; he had designed to marry the younger sister, but she had determined to retire into a convent, and Haydn was persuaded by the father to take the elder one instead, for whom he had always entertained an objection. 'It is nothing to her,' said Haydn near the close of his life, 'whether her husband be a cobbler or an artist.' Her sole ambition was to squander Haydn's earnings. In 1760 Prince Esterhazy offered him the post of vice-capellmeister. His duties in this new situation were to conduct two operas a week, for which he sometimes had to compose the music, to conduct and compose for an orchestral concert every afternoon, to have a fresh composition for the prince's 'reception' every morning, besides supplying the music for incidental

water parties, dances, &c. Many of Haydn's most beautiful symphonies were written here, and the greater number of his magnificent quartets. The excessive demands on his invention do not seem to have impaired its fertility in the slightest. After the death of Prince Esterhazy in 1790 Haydn accompanied Salomon the violinist to England, where, in 1791-92, he produced six of his *Twelve Grand Symphonies*. His reception was brilliant in the highest degree. On his return to Vienna he had Beethoven for a pupil. In 1794 he made a second engagement with Salomon for England, and during this period brought out the remaining six symphonies. In England he first obtained that recognition which afterwards fell to his share in his own country. On his return to Austria he purchased a small house with a garden in one of the suburbs of Vienna. Here he composed his oratorios the *Creation* and the *Seasons*. The former work, the harmonies of which are pervaded with the fire of youth, was written in his sixty fifth year; the *Seasons* (completed in eleven months) was almost his last work. He died at Vienna, 31st May 1809.

In person Haydn was below the middle stature. His features were regular, and the general cast of his countenance a stern one. He had the peculiarity of never laughing aloud. He was very neat and methodical in his habits—composing a certain number of hours daily, and wearing full court dress when so engaged. His musical style is marked by the predominance of melody—melody in its tenderness, melody in its power, melody incessant. His works have therefore more spontaneousness and charm than the older school of Bach and Handel, but less massiveness, sublimity, and majesty. He clearly realised and pursued his aim, laying down the principle that 'melody is the charm of music, and the invention of a fine air is a work of genius.' He is the father of the symphony, and conduced more than any other man to that separation of instrumental music from vocal, unknown or little practised before his day, which has given an independent life to instrumental music up to the present time.

Haydn's works are exceedingly numerous, comprising 125 symphonies, 83 quartets, 38 trios, 14 operas, 8 oratorios, 175 pieces for the baritone, 24 concertos for different instruments, 14 masses, 1 Stabat Mater, 10 smaller church pieces, 44 sonatas for the pianoforte, with and without accompaniments; 12 German and Italian songs, 39 canzonets, 13 hymns in three and four parts, the harmony and accompaniment to 364 old Scottish songs, besides a prodigious number of divertissements and pieces for various instruments.

Compare Carpani's *Le Haydine* (2d ed. Padua, 1823); Haydn's autobiographical sketch, first published in the *Wiener Zeitschrift für Kunst* (1836); Karajan's *Joseph Haydn in London* (Vienna, 1861); Pohl, *Joseph Haydn* (3 vols. 1875-90); Miss Townsend's *Life of Haydn* (Lond. 1884).

Haydon, Benjamin Robert, historical painter, whose biography forms one of the saddest pages in the record of British art, was born at Plymouth on 25th January 1786. He attended the grammar-school of Plympton, where Sir Joshua Reynolds had been educated; and his father, a bookseller, being desirous that his son should follow his own trade, placed him in his shop. But, in spite of delicate eyesight, the boy was resolved to become a painter, and in May 1804 he was admitted a student of the Royal Academy, where he was befriended and influenced by Fuseli, the keeper. Three years later he exhibited his first picture, 'Joseph and Mary resting on the Road to Egypt,' and after studying assiduously for three months the Elgin marbles, whose purchase by the nation he afterwards enthusiastically advocated, he produced his 'Dentatus,' a commission from Lord Mulgrave. The work was coldly received by the Academy in 1809, and hung in the anteroom; and this treatment was the beginning of the painter's rupture with that body, which embittered his life and damaged his prospects. In the following year he began a large subject from *Macbeth*, which had been commissioned by Sir George Beaumont, but was afterwards declined. He was more successful with his 'Judgment of Solomon,' probably his finest production, now in the collection of Lord Ashburton, which he sold for 700 guineas. It gained a prize of 100 guineas from the Royal Institution, which had awarded a like sum for the 'Dentatus.' Having visited the Continent with Wilkie in 1814, and studied the old masters in the Louvre, Haydon began his 'Christ's Entry into Jerusalem,' which was completed in 1820, and realised £1700 by exhibition in the Egyptian Hall, London. It is now in the art-gallery of Philadelphia. Another immense religious subject, 'The Raising of Lazarus,' was completed in 1823, in the midst of great difficulties. The artist had been arrested for debt during its progress, and during the rest of his life he was never able to free himself from financial embarrassments, though it was proved that during six years, from 1831 to 1836, he had earned £4617 by his art. His 'Mock Election,' purchased by George IV. for 500 guineas, was founded upon a scene witnessed by the painter while a prisoner in King's Bench. He resorted to every kind of expedient to meet the needs of the moment. Greatly against his will he took to portrait-painting; a public subscription was raised on his behalf; he raffled his 'Eucles' and 'Xenophon's First Sight of the Sea;' he delivered a popular series of lectures on painting and design in 1836, published in two volumes in 1844. In 1832 Lord Gray commissioned the well-known picture of 'The Reform Banquet,' and in 1834 the Duke of Sutherland gave 400 guineas for a 'Cassandra.' Haydon had never wearied of urging upon government and persons of influence the necessity for the national encouragement of art, and it was a bitter disappointment when he failed to obtain employment by the commissioners for the decoration of the Houses of Parliament. He was further crushed by the entire want of success which attended his exhibition of two completed pictures from the designs which he had prepared for the cartoon competition; his mind gave way, and on 20th June 1846 he shot himself in his studio before his unfinished painting of 'Alfred's First Parliament.' The works of Haydon are elevated in aim and subject, and Mr G. F. Watts, R.A., has pronounced that 'his expression of anatomy and general perception of form are the best by far that can be found in the English school, and I feel even a direction towards something that is only to be found in Phidias.' His works, however, are very unequal in their several parts; his execution was seldom equal throughout to his conception; and most of his productions bear only too evident traces of the haste and the untoward circumstances amid which they were executed. See the *Life of Haydon, from his Autobiography and Journals*, edited by Tom Taylor (3 vols. 1853); and his *Correspondence and Table Talk*, with a Memoir by his son (1876).

Haye, La. See Hague.

Hayes, Augustus Allen, chemist, was born at Windsor, Vermont, in 1806, studied chemistry under Professor Dana, and settled in Boston in 1828. He discovered the organic alkaloid sanguinaria, carried through experiments which led to the construction in 1838 of improved furnaces and boilers, suggested the process of reducing pig to

malleable iron without loss by the use of the oxides of iron, as well as new processes in copper-smelting, the decomposition of alcohol, and the formation of chloroform, and made important investigations into the properties of guano. He also examined the constitution of sea-water and fresh water at various depths, prepared a report for the navy department on the copper-sheathing of vessels, and supplied a novel process for the manufacture of saltpetre. Hayes was for many years state assayer of Massachusetts, and died in Brookline there, 21st June 1882.

Hayes, Isaac Israel, Arctic explorer, was born in Chester county, Pennsylvania, 5th March 1832, graduated in medicine at the University of Pennsylvania in 1853, and sailed as surgeon in the Kane expedition in search of Franklin. The story of his attempt to reach Upernivik in 1854 is told in *An Arctic Boat-journey* (1860). In 1860–61 he conducted a second expedition to the Arctic regions; and in 1869 he again visited Greenland. His third voyage is described in *The Land of Desolation* (1871). He was surgeon of volunteers from 1862 to 1865, retiring with the brevet rank of lieutenant-colonel; and he served in the New York assembly for five years. His Arctic work was recognised by medals from the London and Paris geographical societies. He died 17th December 1881.

Hayes, Rutherford Birchard, nineteenth president of the United States, was born at Delaware, Ohio, 4th October 1822. He graduated at Kenyon College, Ohio, in 1842; and, having studied law at Harvard, he practised as a lawyer at Cincinnati, 1849–61. In the civil war Hayes served with distinction as an officer of volunteers, being once severely wounded, and ultimately attained the rank of brevet major-general. He was returned to congress from Ohio in 1865 and 1866, chosen governor of his state in 1867, and re-elected in 1869 and again in 1875. In 1876 he was selected as the Republican candidate for the presidency of the United States, the Democratic candidate being Samuel J. Tilden (q.v.). The election which followed was notable for the exciting complications and the period of tension and suspicion that ensued. In Louisiana two electoral boards were commissioned by rival claimants to the governorship, and in some of the other states questions arose touching the legality of the return of the Republican presidential electors. Finally, an electoral commission was created by act of congress, consisting of five judges of the supreme court, five senators, and five representatives. This body, made up of eight Republicans and seven Democrats, gave the disputed votes to Hayes, by a majority of eight to seven. The electoral vote was thus returned at 185 for Hayes against 184 for Tilden; the popular vote, as counted, stood 4,284,265 for Tilden and 4,033,295 for Hayes. This decision was generally acquiesced in, although the conviction of the Democratic party that their candidate had been unjustly deprived of office remained unshaken; and as late as 1878 the Democratic majority of a congressional committee of investigation issued a report declaring the action of the returning boards in Louisiana and Florida to have been fraudulent. Under the Hayes administration the country recovered much of its commercial prosperity, which had suffered severely in the financial crash of 1873. Two features in Hayes's policy were reform of the civil service (in pursuance of which he removed from the collectorship of customs at New York Chester Alan Arthur, q.v.) and the conciliation of the southern states. He was also active in pressing forward the resumption of specie payments; but the bill for the monetisation of silver was carried against his veto. He died at Fremont, Ohio, 16th January 1893. See Life by Stoddard (1889).

Hayesine, also called Borate of Lime and Ulexite, is a double salt of sodium and calcium, and a source of Boracic Acid (q.v.).

Hay-fever, also called Hay-asthma and Summer-catarrh, a disease mostly met with in early summer, has as symptoms those of a common catarrh—viz. redness and swelling of the nasal mucous membrane, with a copious watery discharge and repeated paroxysms of sneezing, irritation of the eyes, and intense headache. There are also present general malaise, loss of appetite, and more or less feverishness; and difficulty of breathing is added when the bronchial mucous membrane is affected. Hay-fever is most commonly a disease of adult life, but it may occur at all ages. It usually returns annually when the patient is subjected to the exciting cause, which is oftenest in the form of floating pollen of different grasses, although other things such as dust or bright sunlight may set up an attack. Three factors essential to the production of hay-fever are a nervous constitution or idiosyncrasy, a local irritability, and an external exciting cause. The treatment to be successful must be directed to these: (1) improve the health by quinine, arsenic, or other tonics, and soothe the nervous state by bromide of potassium or antipyrin; (2) act locally by pungent inhalations, as iodine, or by the thermo-cautery; (3) finally remove the patient from the cause by sending him to the seaside or for a voyage. See *Hay Fever*, by Sir Morell Mackenzie (4th ed. 1887).

Hayley, William, Cowper's biographer, was born at Chichester, 9th November 1745, but abandoned legal studies for a life of lettered leisure, living in London, at Eartham in Sussex, and lastly at Feltham, where he died 20th November 1820. Among his works are didactic *Essays* in verse on painting, on history, on epic poetry, *The Triumphs of Temper: a Poem*, some plays, a Life of Milton, a Life of Romney, and his most memorable monument, *The Life of Cowper* (1803; see Cowper). *Memoirs* of and by himself were published in 1823.

Haym, Rudolf, philosopher and writer, was born at Grünberg in Silesia on 5th October 1821. In 1848 he sat in the national assembly at Frankfort; but in 1851 he began to lecture on philosophy and German literature at Halle, and was eventually appointed professor there in 1868. He has written biographies of Wilhelm von Humboldt (1856), Hegel (1857), Schopenhauer (1864), and Herder (1877–85), as well as a useful monograph, *Die Romantische Schule* (1870).

Haynau, Julius Jakob, Baron von, an Austrian general, was born at Cassel, in Germany, 14th October 1786. Entering the Austrian service in 1801, he signalised himself during the Italian campaigns of 1848–49 by his ruthless severity, especially at the capture of Brescia, where his flogging of women and other atrocities gained him the name of the 'Hyæna of Brescia.' Haynau was engaged in the siege of Venice, when he was summoned by the emperor to Hungary, in May 1849, to take the supreme command of the forces in that country. The storming of Raab, his victory at Komorn, his occupation of Szegedin, and his victories on the Theiss contributed materially to the final success of the imperialists. But Haynau's atrocious severity towards the defeated Hungarians excited the detestation of Europe. Although appointed dictator of Hungary after its pacification, he was nevertheless dismissed in 1850 on account of the intractability of his character. In the same year, when visiting the

brewery of Messrs Barclay & Perkins, in London, he was assaulted by the draymen, on account of his cruelty, and escaped with his life, but the loss of his moustache. Baron Schonhals, in a biography of his friend Haynau (Gratz, 1853), tries to exonerate his character, and asserts that he only acted in obedience to the orders of his masters. Haynau died at Vienna, March 14, 1853.

Hayne, Robert Young, an American statesman, born in South Carolina in 1791, was admitted to the bar in 1812, served in the war with Great Britain, and at its close returned to his practice in Charleston. He was a member of the state legislature in 1814-18, and became speaker, was attorney-general of the state in 1818-22, and sat in the United States senate from 1823 to 1832. He was a vigorous opponent of protection, and in 1832 boldly supported in congress the doctrine of Nullification (q.v.). Daniel Webster's reply ranks among his ablest speeches. In November 1832 South Carolina adopted an ordinance of nullification, in December Hayne was elected governor, and the state prepared to resist the federal power by force of arms. A compromise, however, was agreed to (see Jackson), and the ordinance was repealed. Hayne died 24th September 1839.

Hay River, a feeder of Great Slave Lake in the Canadian North-west. In its course, north-east to the southern shore of the lake, it descends the two Alexandra Falls, about 250 feet high and 300 yards wide.

Hayti, or Haïti ('mountainous country,' otherwise Hispaniola, or Santo Domingo), is, after Cuba, the largest of the West Indian Islands, now divided into the independent states of Hayti and the Dominican Republic (q.v.). For the map, see West Indies. It is nearly equidistant from Porto Rico on the E., and from Cuba and Jamaica on the W., with the Caribbean Sea on the S., and with the Bahamas and the open ocean on the N. Hayti lies between 17° 37' and 20° N. lat., and between 68° 20' and 74° 28' W. long. It belongs to the group of the Greater Antilles, and, like all the principal members of its series, its greatest length (about 400 miles) is in the direction from west to east of the chain of which it forms a part; its greatest breadth is 160 miles. Area, including the islands of Tortuga, Gonaive, &c., about 28,820 sq. m., or nearly that of Scotland. The country is mountainous, being traversed longitudinally by northern, central, and southern ridges, terminating in headlands on either coast; but between these ranges are wide and fertile plains. There are no active volcanoes in the island, but earthquakes are frequent. The highest peak is Loma Tina (10,300 feet), and in the middle section of the Sierra del Cibao the average height is 7000 feet. The climate is hot and moist in the lowlands, the temperature at Port-au-Prince ranging from 67° to 104° F.; the mean range in the highlands is from 60° to 76° F. The heaviest rains are in May and June, and occasional hurricanes visit the island. Agriculture is very backward, although Hayti is one of the most fertile spots in the West Indies; while its excellent harbours, more especially those in the Gulf of Gonaive on the west, offer considerable facilities to foreign trade. The mountains are clothed with forests of pine and oak, and the island is rich in mahogany, satinwood, rosewood, and other valuable timbers. Cotton, rice, maize, cocoa, ginger, arrow-root, yams, tobacco, and numerous fruits are indigenous; and the mango, bread fruit, sugar, coffee, and indigo are also produced. The minerals are now little worked, though some gold-washing is still carried on in the streams descending the northern slope of the Cibao. The rivers are inconsiderable, and useless for navigation. The largest lake, besides several bodies of fresh water, is the salt lake of Enriquillo, 25 miles inland from the south shore. Both rivers and lakes abound in caymans as well as fish. Birds are few, but reptiles and insects are numerous; the agouti is the largest wild mammal.

Hayti was discovered in 1492 by Columbus, who landed here on 6th December; and within little more than one generation the aborigines had been swept away by the remorseless cruelties of the Spaniards. Their place was filled with negro slaves, who were introduced as early as 1505. Next came the Buccaneers (q.v.), who settled in the island of Tortuga, and ultimately gained a footing on the mainland; and, as those marauders were chiefly French, the western portion of Hayti, which was their favourite haunt, was in 1697 ceded to France by the peace of Ryswick, thus presenting the first important break in the unity of Spanish America. For nearly a hundred years the intruders imported vast reinforcements of Africans; while the mulattoes, who were a natural incident of the concomitant license, rapidly grew, both socially and politically, into an intermediate caste, being at once uniformly excluded from citizenship and generally exempted from bondage. In 1791, under the influence of the French Revolution, the mutual antipathies of the three classes—white, black, and mixed—burst forth into what may well be characterised as the most vindictive struggle on record—a struggle which, before the close of the 18th century, led to the extermination of the once dominant Europeans, and the independence of the coloured insurgents. Thus, as the emancipated bondmen mostly belonged, at least in form, to the Church of Rome, Hayti now exhibited the only Christian community of negro blood on either side of the Atlantic. In 1801 France sent out a powerful armament to recover her revolted dependency, treacherously seizing and deporting the deliverer of his brethren, Toussaint l'Ouverture (q.v.). In 1803, however, she was constrained to relinquish her attempt; and in 1804 Dessalines, aping the example of Napoleon, proclaimed himself Emperor of Hayti, thus reviving the indigenous name of the island, which had been in disuse for upwards of three hundred years.

This great change was fatal to the commercial prosperity of French Hayti, decidedly the more valuable section of the island. In its progress it had destroyed capital in every shape; and in its issue it could not fail to paralyse labour under circumstances where continuous exertion of any kind was equally irksome and superfluous. Nor was the political experience of the lately servile population more satisfactory than its economical condition. Sometimes consolidated into one state, and sometimes divided into two, the country alternated, through the instrumentality of one revolution after another, between despotism and anarchy, between monarchy (more or less constitutional or imperial) and republicanism. Its only tranquil period of any duration coincided with the rule of President Boyer (q.v.), which subsisted from 1820 to 1843—its last twenty one years comprising not merely the whole of French or Western Hayti, but likewise the Spanish or eastern portion of the island, whose inhabitants in 1843 formed themselves into the Dominican Republic (q.v.). Hayti, thus united, was in 1825 recognised even by France, on condition of paying 150 million francs, or £6,000,000, as a compensation to the former planters—a sum reduced in 1838 to sixty millions. The western portion of the island remained republican in its form of government until 1849, when its former president, the negro General Soulouque, proclaimed an empire, and assumed the title of Emperor Faustin I. In 1859, however, a republic was again proclaimed and a new constitution adopted, which was modified in 1867. Few

presidents have since been permitted to complete their term of office (seven years), which has usually been cut short by revolutions. In 1889 General Hippolyte succeeded in the chief-magistracy General Legitime, whom he had driven out of the country. Sir Spenser St John's *Hayti, or the Black Republic*, gives a truthful picture, at once melancholy and ludicrous, of the utter savagery that is dominant in the western state. Official peculation, judicial murder, and utter corruption of every kind underlie the forms and titles of civilised government; the religion, nominally Christian, is largely *vaudoux* or serpent-worship, in which actual and horrible *cannibalism* is even now a most important element. Instead of progressing, the negro republicans have gone back to the lowest type of African barbarism.

The area of the western portion of the island, the negro republic of Hayti, is about 9200 sq. m.; the population was stated in 1888, somewhat extravagantly, at 960,000; it is probably under 600,000. The capital, Port-au-Prince, is reported to have 30,000 inhabitants, and perhaps has 20,000. Under the president are a senate and house of representatives, and four heads of departments. The returns of income and expenditure are merely estimates, and the disorders of civil war have in recent years rendered these more than usually valueless. There is a large floating debt, chiefly resulting from the issue of paper money by successive governments. The total debt amounts to between £3,000,000 and £4,000,000. The annual revenue is, since 1894, stated at £1,250,000, a sum generally exceeded by the expenditure. The army consists nominally of 6828 men, mostly infantry; some half-dozen small vessels constitute the navy. The dialect of the people is a debased French. The exports of Hayti may have a value of about £1,000,000 a year; the chief articles are coffee, cacao, logwood, mahogany, and cotton. Of the imports, valued at about £700,000 annually, over two-thirds come from the United States, the rest mainly from Germany, France, and Britain.

See St John, *Hayti, or the Black Republic* (1884; 2d ed. 1889); works by Maidou (1847), Ardouin (Paris, 1853-61), Linslant-Pradine (Paris, 1851-65), Janvier (Paris, 1883-85, 86), La Selve (1876-81), Nau (Paris, 1886), Fortunat (1888), Rouzier (1892), Marcelin (1893), Justin (1894), and Tippenhauer (Leipz. 1893).

Hayward, ABRAHAM, essayist and talker, was born at Wishford, in Wiltshire, 31st October 1802. He had neither public school nor university education, but after keeping terms at the Inner Temple was called to the bar in 1832. His leanings were, however, more to letters than to law, yet he founded and edited the *Law Magazine*, and to every one's surprise was made Q.C. by Lord Lyndhurst in 1845. He published in 1833 his excellent prose translation of the first part of *Faust*, and soon became a busy contributor to the newspapers and magazines, especially the *Quarterly Review*, in which readers soon learned to recognise his personality in an unusual combination of vivacity, epigrammatic verve, and critical acumen. By his brilliant conversation, his wealth of anecdotes, his whist-playing, and his artistic interest in 'the art of dining' he delighted society almost down to his death, at London, February 2, 1884. Many of his best articles were reprinted in his *Biographical and Critical Essays* (2 vols. 1858), the second series (2 vols. 1873), and the third (1 vol. 1873); and in *Sketches of Eminent Statesmen and Writers* (2 vols. 1880). Other books were *Autobiography and Remains of Mrs Piozzi* (2 vols. 1861), *Selections from the Diary of a Lady of Quality* Sir Watkin Wynne's daughter (1864), and a somewhat perfunctory book on *Goethe*, in 'Foreign Classics for English Readers' (1877). His little books *The Art of Dining* (1852), *Lord Chesterfield* and *George Selwyn* (both in 1856), and *Short Rules of Modern Whist* (1878)—were widely circulated. In 1878 he published in two volumes his *Selected Essays*. His *Select Correspondence* was given to the world in two volumes in 1886.

Hazard, a game with two dice. The *caster* calls 5, 6, 7, 8, or 9 for the *main*. He then throws. If he throws the number called, or if he throws 12 when 6 or 8 is the main, or 11 when 7 is the main, he *nicks*, and wins of his opponent (named the *setter*). If he throws 2, 3, 11, or 12 when 5 or 9 is the main, or 2, 3, or 11 when 6 or 8 is the main, or 2, 3, or 12 when 7 is the main, he loses. If he throws any other number—thus, when 7 is the main, if he throws 4, 5, 6, 8, 9, or 10—it is called his *chance*. He then continues to throw until either the main or the chance is thrown. If the main is first thrown, the setter wins; if the chance is first thrown, the caster wins.

Hazaribagh, chief town of the district of the same name in the division of Chota Nagpore, Bengal. It is really a cluster of hamlets, which sprung up round the former military bazaar, with tilled fields between; the European troops have now for some years been withdrawn. Pop. 15,306. —Hazaribagh *district* has an area of 7021 sq. m., and a population of a million and a quarter.

Hazebrouck, a town in the French department of Nord, 28 miles WNW. of Lille by rail. The parish church (1493–1520) is surmounted by a spire of open work, 260 feet high. There are some linen and tobacco manufactures. Pop. 7680.

Hazel (*Corylus*), a genus of trees of the natural order Cupuliferæ, of which the fruit is a nut in a leafy and laciniated cup, the enlarged involucre of the female flower. The male flowers are in cylindrical catkins; the female flowers appear as mere clusters of coloured styles at the extremities of buds. The Common Hazel (*C. Avellana*) is a low

Common Hazel (*Corylus Avellana*): *a*, male and *b*, female flowers; *c*, fruit.

tree, a native of Britain, and of all the temperate parts of Europe and Asia; it is common also in North America. There are ten or twelve improved varieties cultivated extensively in Kent, especially around Maidstone and in some other parts of England. Of these there are two types—one with round nuts, named *cobs*; the other with elongated nuts, named *filberts*. The cup or involucre of the former is shorter, more open, and not so much lacerated as that of the latter. Of either type there is a variety in which the pellicle enclosing the kernel

is deep red; and both of these are highly esteemed. These particular varieties are propagated by suckers which are more or less freely produced, by layers, and by budding and grafting. The tree is extensively grown in some parts of England for coppice-wood, being reared for this purpose from seed. The young straight stems and branches are employed for making crates, baskets, hurdles, hoops, stakes, &c.; and the larger wood for charcoal, which is in great request for forges, for the manufacture of gunpowder and artists' crayons. Chips of the wood are in Italy sometimes put in turbid wine for the purpose of fining it; and the roots are used by cabinet makers for veneering. Magical properties have been ascribed to hazel-rods by the credulous, as it was of them the *Dowsing rod* (q.v.) was formed for the purpose of discovering water, minerals, or buried treasure. From the wood an empyreumatic oil is extracted, which is a vermifuge, and alleged to be a cure for toothache. Hazel-nuts yield, on pressure, about half their weight of a bland fixed oil, often called *nut oil* in Britain, the hazel nut being popularly known by the term *nut* alone; but in Germany it is walnut oil which is usually called nut oil. Hazel-nut oil has drying properties, and is much used by painters; it is also used by perfumers as a basis with which to mix expensive fragrant oils; and it has been employed medicinally in coughs.

The larva of a weevil (*Balaninus nucum*) feeds on the kernels of hazel-nuts. The parent female makes a hole into the nut by means of her long snout, and there deposits an egg. Great numbers of nuts are thus destroyed.

The Beaked Hazel (*C. rostrata*), a species having a very hairy fruit-cup prolonged into a long beak, is a native of the northern parts of America. Its kernel is sweet.—The Constantinople Hazel (*C. colurna*), the nuts of which are considerably larger than those of the common hazel, is a native of the Levant, from which the fruit is imported into Britain. It is much used for expressing oil, but is a less pleasant fruit than many kinds of cob-nut and filbert. A Himalayan species of hazel (*C. ferox*) has a spiny fruit-cup, and an excessively hard nut. *Barcelona nuts* are the nuts of a variety of the common hazel, kiln-dried before their exportation from Spain. Hazel-nuts not subjected to this process cannot be kept long without losing in part their agreeable flavour, and contracting a sensible rancidity, except in air-tight vessels, in which they are said to remain fresh even for years.

Hazleton, a borough of Pennsylvania, 80 miles NNW. of Philadelphia, has ironworks, lumber-mills, and railway-car shops, but is of importance mainly as the chief business centre of the rich Lehigh coalfield. Pop. 7161.

Hazlitt, William, was born at Maidstone on April 10, 1778. His father was a Unitarian clergyman who belonged to the county of Antrim. In his fifteenth year he began to study in the Unitarian College at Hackney, with the view of becoming a dissenting minister, a design which he early abandoned. In 1798 he formed the acquaintance of Coleridge, who encouraged him to compose his *Essay on the Principles of Human Action* ('the only thing,' he said, 'which I ever piqued myself upon writing'), which was not published, however, until 1805. For some time he endeavoured to earn a living as a portrait-painter; and, according to Northcote, would have become a great artist had he not forsaken his easel for his desk. In 1806 he published his *Free Thoughts on Public Affairs*, and in 1807 his *Reply to the Essay on Population by the Rev. T. R. Malthus*. After his marriage with Miss Stoddart in 1808 he lived at the village of Winterslow, in Wiltshire, until 1812, when he removed to York Street, Westminster, and found employment as a writer on the *Morning Chronicle* and *Examiner*. From 1814 to 1830 he contributed to the *Edinburgh Review*. His *Round Table: a Collection of Essays on Literature, Men, and Manners*, and the most popular of his works, his *Characters of Shakespeare's Plays*, appeared in 1817. Between 1818 and 1821 he delivered lectures at the Surrey Institute, which were afterwards published under the titles *Lectures on the English Poets*, on the *English Comic Writers*, and on the *Dramatic Literature of the Age of Elizabeth*. His marriage proved an unhappy one, and, after living for some time apart, Hazlitt and his wife were divorced in 1822. He was fond of retiring to Winterslow Hut, a coaching-house on the high-road from London to Salisbury. At this lonely inn, which stands amid bleak wolds on the verge of Salisbury Plain, he wrote most of the essays which he contributed to the *London Magazine*, and which were afterwards republished in his *Table Talk* (1821) and *Plain Speaker* (1826). An unfortunate passion for the daughter of a tailor with whom he lodged found expression in the *Liber Amoris, or the New Pygmalion* (1823), a book of a strong though painful interest. In 1824 he married a lady of some means, who travelled with him to Italy, but left him, for causes which can only be conjectured, during the return journey, and never joined him again. His *Selections from the English Poets* and *Sketches of the Principal Picture Galleries in England* appeared in 1824; his *Spirit of the Age, or Contemporary Portraits*, which some critics consider the ripest in thought and most felicitous in style of all his works, in 1825; and his *Life of Napoleon Bonaparte* in 1828–30. His last years were darkened by ill-health and money difficulties. He died on September 18, 1830.

Wayward and irascible, a prey to melancholy, and too often the victim of a rash and haughty self-confidence, Hazlitt was at bottom generous, ardent, and sincere. But his defects were sharpened by unsuccess, and above all by the scurrilous malignity with which his character and his writings were traduced by hired libellers of adverse politics. The scope of his powers was never recognised by his contemporaries, though, as Thackeray has said, there were probably not in all England twelve men with powers so varied. His genius had many facets. He excelled in description and in narrative, in reflection and in critical analysis. He wrote of nature and of art and the characters of men; as a critic of the drama he has never been equalled. He was one of the deadliest controversialists, a master of epigram and burning invective and withering irony. His letter to William Gifford stands unsurpassed as an example of polished vituperation. His judgment was at times clouded by prejudice and distorted by his love of paradox. But of all the Georgian critics he was the most eloquent, the most catholic, the most thoroughly equipped. He never wrote in cold blood; he welcomed excellence everywhere. He did justice alike to the Lakers and to the Queen Anne men. He was not less discriminating than enthusiastic. His style ranges from lively gossip to glowing rhapsody; at its best it touches one of the high-water marks of English, it is at once so vigorous and so graceful, so lucid and so rich, so exquisitely apt are the epithets, so firmly built are the sentences, so noble is the rhythm of the periods. His autobiographic essays are perhaps of all his works the most delightful—stamped with the seal of truth, tremulous with pathos, and bathed in the light of poetic imagination. His writings have never gained the recognition they merit; yet, with all his defects, it would be hard to point to Hazlitt's master in all the ranks of English critics.

See G. Saintsbury's article in *Macmillan's Magazine* for 1887; Leslie Stephen's *Hours in a Library* (2d

series, 1877); and Bulwer Lytton's *Quarterly Essays* (1875). A collection of Hazlitt's works in 7 vols.—exclusive of the *Life of Napoleon*—has been edited by his grandson, W. C. Hazlitt, who also wrote Memoirs of him (2 vols. 1867). Alexander Ireland issued an annotated List of his writings (1868), and an admirable selection from his writings, with a brief essay on his life and characteristics as an author (1889).

Head. See BRAIN, CONCUSSION, EAR, EYE, SKULL, TEETH, &c.

Head, SIR EDMUND WALKER, Bart., governor-general of Canada, was the son of the Rev. Sir John Head, and was born in 1805, near Maidstone, Kent. From Winchester he passed to Oriel College, Oxford, where he took a first in classics in 1827, and became a Fellow of Merton; in 1838 he succeeded his father, the seventh baronet. After serving as poor-law commissioner, he became in 1847 lieutenant-governor of New Brunswick, and held this post until September 1854, when he succeeded the Earl of Elgin as governor-general of Canada. He retired in 1861, was made a civil-service commissioner in 1863, and privy-councillor in 1867. He wrote a *Handbook of Spanish Painting*, and other popular books on art, and published *Ballads and other Poems, original and translated* (1868). He died 28th January 1868.

Head, SIR FRANCIS BOND, Bart., author, and governor of Upper Canada, was born at Hermitage, near Rochester, 1st January 1793. He entered the corps of Royal Engineers, served at Waterloo and elsewhere, and had attained the rank of major when he retired from the service. In 1825 he accepted an engagement from a private company to work some gold and silver mines on the river Plate; and his spirited *Rough Notes* of his travels across the pampas and over the Andes gained for him the name of 'Galloping Head.' In 1835 he became governor of Upper Canada, where, at the head of the militia, he succeeded in suppressing an insurrection, which had its origin, as it was said, in his injudicious measures; but this charge he may fairly be held to have refuted in his *Narrative* (1839) of these events. In 1837 he resigned his post, and was created a baronet in 1838. After his retirement he devoted himself to literary pursuits, and for some years enjoyed a pension of £100 'for his services to literature.' His books include *Bubbles from the Brunnen of Nassau*, *A Faggot of French Sticks*, *Stokers and Pokers*, *A Visit to Ireland*, *The Emigrant*, *The Horse and his Rider*, *The Royal Engineer*, and Lives of Bruce, the traveller, and Sir John Burgoyne. He died 20th July 1875.

Headache can scarcely ever be called a disease, but it is a common symptom of many ailments. It is sometimes caused by serious mischief within the cranium, but far more frequently it depends upon an alteration in the quality of the blood, or in a deficient or excessive supply of it to the head. The deterioration in quality may be caused by fevers, by inflammations of various organs—e.g. the kidneys, or even by breathing the air of a crowded room. The congestive form of headache is often produced by mere mechanical obstruction to the return of blood from the head. A tight collar or an awkward position of the neck during rest may cause it. This form of headache is aggravated by stooping. On the other hand the anæmic variety is often relieved by lying down. The neuralgic headache is one of the commonest of all, and is especially associated with the hysterical tendency. Another variety which is on the increase in this hurried and hard-driven generation is that caused by excessive brain-work. Lastly, there is the sick headache, megrim or migraine, which comes on periodically in paroxysms, often associated with bilious vomiting.

The great rule for the treatment of headache is first of all to correct the general morbid condition on which it depends. Without this, local treatment is usually of little avail, and at best is only of temporary benefit. Except in anæmic cases the patient should have the head and shoulders well raised during sleep. Aperients give relief in nearly every form except the neuralgic. If the blood is deteriorated it must be improved by iron, 15 to 20 drops of the tincture of the perchloride, three times a day. Quinine is of use in periodic headaches in doses of 2 or 3 grains, three or four times a day. In neuralgic pain about the forehead menthol rubbed on often gives speedy relief. Gelsemium and Indian hemp are useful internal remedies, but opium is of doubtful value. Bromide of potassium in 30-grain doses may be given with the Indian hemp, if there is much restlessness. Of local applications chloroform and mustard are perhaps the most generally serviceable. In all cases the diet and habits of life should be carefully regulated.

Head Borough, an old term for the head of a borough, or high constable. See CONSTABLE.

Head-hunting. See DYAKS.

Head-money. See POLL-TAX.

Headon Beds. See OLIGOCENE SYSTEM.

Health. See HYGIENE.

Health, BILL OF, in Shipping, is a document carried by every British ship, unless engaged in the coasting trade, or specially exempted. It is granted at home by the customs, and abroad by the British consular agent, or, if there is no such person, by a British merchant or foreign consul. When no contagious or infectious disease is known to exist at the place of departure, the bill is 'clean;' when there is reason to fear the appearance of such disease, the bill is 'suspected;' when such disease actually exists, the bill is 'foul.' The practice of other countries is identical. See QUARANTINE.

Health, BOARD OF. See PRIVY-COUNCIL.

Health-resorts, frequented for combating disease or invigorating the comparatively healthy, fall into several well-marked groups. (1) Sea-bathing quarters have long been in vogue amongst civilised nations, though the periodical exodus from cities is of modern origin. (2) The remedial and invigorating agency of mountain air has been more recently recognised, but is now fully established. Hence the popularity of many inland highland districts in Scotland, Switzerland, and Norway. (3) Curative wells—thermal, muriated, alkaline, sulphated, chalybeate, sulphureous, calcareous—have been frequented from the earliest times, and are found in many countries. The various kinds of water and their beneficial qualities are dealt with in the article MINERAL WATERS. (4) Climatic health-resorts at a high altitude, such as Davos Platz, Andermatt, Meran, &c., have of late come into favour because of their value for persons recovering from acute illness, and who are able to take active outdoor exercise; and specially for those in the early stages of phthisis, or in chronic phthisis unaccompanied by fever or blood-spitting. When there is hæmoptysis, such a climate is disadvantageous or dangerous—as it is also in cases of heart-disease, chronic bronchitis, and chronic rheumatism. (5) Residence for longer or shorter times in exceptionally temperate, mild, or warm climates is recommended for pulmonary diseases, particularly phthisis. Such favoured regions are Bournemouth, Torquay, and other places on the south coast of England and the Isle of Wight, the Riviera (Mentone, Nice, &c.), Hyères, Pozzuoli and other sheltered places in south Italy, Palermo, Madeira, Algiers, and Upper Egypt. Florida, southern California, and the

pine woods of Georgia are in favour with Americans. The climate of Colorado, bracing though not altogether mild, is also beneficial to bronchial and pulmonary weakness. In hot countries the sanitariums are usually cool hill stations—thus, in India, Simla, Darjiling, Naini Tal, Utakamand, Pachmarhi. (6) Climatic resorts where additional help is obtained for special treatment—such as the grape cure in phthisis (Meran), whey cure (Gais in canton Appenzell), and the goat's milk, ewe milk, or cow's milk cure. The influence of the pine woods at Arcachon is supposed to be favourable to consumptive patients. Also such special devices as warm mud baths, or the sun bath cure (exposure of the uncovered person to the sun's heat and light), as practised at Veldes in Carinthia. (7) Hydropathic establishments generally. (8) Sea-voyages may also be here noted, as suitable for persons in the early stages of phthisis, and in cases of nervous exhaustion. See BATH, HYDROPATHY, MINERAL WATERS; the articles on the most notable health resorts; and Charteris, *Health Resorts at Home and Abroad* (1885); J. Burney Yeo, *Climate and Health Resorts* (1885); Upcott Gill's *Dictionary of Watering Places* (1885); and Fraser Rae's *Austrian Health resorts* (1888).

Healths. DRINKING OF. See TOASTS.

Hearing. See EAR.

Hearne, THOMAS, an eminent English antiquary, was born in 1678 in the parish of White Waltham, Berkshire, and had his education at St Edmund Hall, Oxford, where he graduated B.A. in 1699. Two years later he was appointed to a post in the Bodleian Library, of which in 1712 he became second keeper. This office he was obliged to resign in 1716 from his inability to take the oaths to the government, but he continued to live at Oxford occupied entirely with his studies. He died 10th June 1735. Hearne compiled and edited no less than forty-one works, all stamped by painful and laborious learning, although poor in style and somewhat rambling in method. They are usually marred by the intrusion of irrelevant matter—even his Jacobitism crept into his prefaces; yet they remain solid contributions to bibliography, and their author deserved better than to be gibbeted in the *Dunciad* as a dull and dusty pedant.

His most important books were *Reliquiæ Bodleianæ* (1703), Leland's *Itinerary* (9 vols. 1710-12), Leland's *Collectanea* (6 vols. 1715), *A Collection of Curious Discourses upon English Antiquities* (1720), and the editions of Camden's *Annals* (3 vols. 1717). Adam of Bexley (1716), William of Newburgh (1719), Fordun's *Scotichronicon* (1722), Robert of Gloucester's *Chronicle* (1724), and that of Peter Langtoft (1725). The *Bibliotheca Hearniana* was published in 1848; *Reliquiæ Hearnianæ*, by Philip Bliss, in 1857. The third volume of *Remarks and Collections of Thomas Hearne* appeared in 1889, edited by C. E. Doble for the Oxford Historical Society. See *Impartial Memorials* of his life by several hands (1736), and the *Lives of Leland, Hearne, and Wood* (Oxford, 1772).

Hearsay. See EVIDENCE.

Hearse, or HERSE (through Fr. from Lat. *hirpex*, 'a harrow'), the carriage in which the dead are conveyed to the grave, but originally the term applied to a triangular bar or framework with upright spikes for holding candles at a church service, and especially at funeral services. It was originally very simple in form, but in the 15th and 16th centuries hearses of great splendour came into use, and were erected in the churches over the bodies of distinguished personages. The framework was of iron or brass, sometimes of beautiful workmanship, square, octagonal, &c. in plan, with pillars at the angles, and arched framework above forming a canopy. The whole was hung over with rich cloths and embroidery, and lighted up with hundreds of wax candles, and decorated with wax images. From this the transition to the modern funeral hearse can be easily traced. In Catholic churches the old hearse still exists as a triangle with spikes, on which candles are placed.

Heart, the central organ of the circulatory system, acting as a force and suction pump in relation to the blood-vessels. It always lies dorsally in Invertebrates, ventrally in Vertebrates, and arises from the strong development of one or more blood vessels. In Vertebrates, the resulting cylinder, lying in the throat region of the embryo, is divided into receiving and expelling portions, *auricle* and *ventricle* respectively, and the whole is enclosed in a more or less marked cavity or ensheathing double bag, the *pericardium*. By curvature and folding, by formation of partitions and ingrowth of valves, the three or four chambered hearts of the higher vertebrates arise. It will be enough to describe the general structure and function of the heart in man.

The human heart lies ventrally in the chest, between the two lungs; it has a broad end or 'base' directed upwards and backwards, and a pointed end or 'apex,' turned downwards, forwards, and to the left; it is kept in position by the attachment of the enswathing pericardium to the upper surface of the Diaphragm (q.v.), and by the large blood-vessels which enter or leave its four chambers; its total size is approximately equal to that of its owner's closed fist. There are two receiving chambers or auricles, of which the right receives all the impure blood brought by the *vena cavæ* from head and body and by the *coronary vein* from the substance of the heart itself, while the left is filled with purified blood brought by the pulmonary veins from the lungs. The auricles pass their contents to the two driving chambers or ventricles, of which the right pumps the impure blood to the lungs, and the left sends the pure blood to the head and body. The ventricles are larger than the auricles, and have strong muscular walls proportionate to their harder work. The left ventricle is stronger than, and partially surrounded by, the thinner right chamber. The right auricle opens into the right ventricle by an aperture guarded by a triple (*tricuspid*) valve, whose three membranous lappets are attached to tendinous cords (*chordæ tendineæ*) arising from muscular processes (*musculi papillares*) on the walls of the ventricle. The opening from the left auricle into the left ventricle is similarly guarded by a double (*mitral* or *bicuspid*) valve. These valves on each side prevent the passage of blood from ventricle to auricle. At the base of the pulmonary artery on the right and of the aorta on the left, there are three pocket-

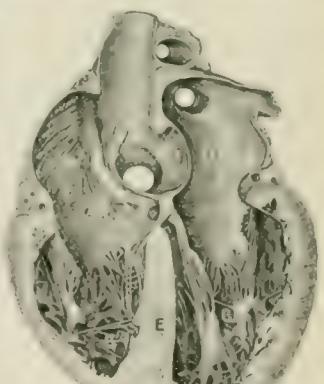


Fig. 1. Section of the Human Heart (after His):
A, right auricle; B, right ventricle; C, left ventricle; D, left auricle; E, partition between the two ventricles. Between the auricles and ventricles on right and left, the tricuspid and mitral valves with their cords and associated muscles are shown.

like (*semilunar*) valves, which prevent backflow from vessels to ventricles.

When the heart is at work, the simultaneous contraction of the two auricles (i.e. of the muscle fibres on their walls) is followed by a similar contraction of the ventricles, and this by a pause or passive interval of re-expansion, after which the rhythm of contraction recommences. In the contraction of the auricles, the mass of blood in the large veins will not permit of a backflow in a peripheral direction, so that virtually all the contents of the auricles pass into the respective ventricles, which at that moment are flaccid and uncontracted. As the ventricles fill, the valves between them and the auricles are partly closed, and this is perfectly accomplished when the contraction of the ventricle sets in. As no blood can then pass back from ventricle to auricle, the energy of ventricular contraction is directed to overcoming the resistance of the semilunar valves guarding the entrance to the pulmonary artery and the aorta, which are moreover elastic vessels full of blood. The state of contraction in auricle or ventricle is called the *systole*; the state of passive relaxation and expansion the *diastole*, and it is evident that by the systole of the auricles the ventricles are filled, and that by the systole of the ventricles their contents are for the most part forced into the arterial systems of lungs and body. As the heart usually beats about seventy-two times a minute, the cycle of events just noted lasts about $\frac{8}{10}$ths of a second, of which the systole of the ventricle lasts about $\frac{3}{10}$ths, that of the auricle perhaps $\frac{1}{10}$th, and the passive interval about $\frac{4}{10}$ths of a second.

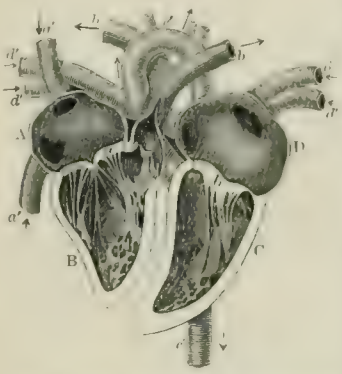


Fig. 2. Diagram of Heart halved and laid open (after Debierre):

A, B, C, D, as in fig. 1. *a*, part of tricuspid valve; *b*, part of mitral; *c*, semilunars at case of pulmonary artery. *a'*, *a''*, inferior and superior vena cava entering A; *b*, *b'*, pulmonary arteries proceeding from B; *c'*, aorta proceeding from C; *d*, *d'*, pulmonary veins entering D.

The activity of the heart has several external indices, such as the *beating*, seen and felt between the fifth and sixth rib on the left side, due to contraction of the ventricles, which makes the 'apex' of the heart strike against the pericardium, and through this on the wall of the chest. There are also sounds produced by the heart: (*a*) the longish dull sound probably caused by the contraction of the muscular fibres of the ventricles and the tension of the valves between these chambers and the auricle; (*b*) the sharp sound due to the sudden closure of the semilunar valves when the contraction of the ventricles ceases. The heart sounds are of great importance in the diagnosis of disease of the heart. They may undergo various changes and may in some cases disappear or be replaced by or accompanied by *murmurs*. These murmurs are caused by the blood flowing through the orifices of the heart which have become changed by disease. At a distance from the heart, the *pulse* or regular dilatation of an elastic artery is a familiar index. The heart is under the control of three sets of nerves: (*a*) from ganglia in its own substance, apparently essential to the regular rhythm of contraction; (*b*) from the sympathetic system, apparently affecting rapidity of action; (*c*) from the pneumogastric or vagus nerve, coming directly from the brain, apparently with arresting power. See AORTA, ARTERY, BLOOD, CIRCULATION; text books of Anatomy by Quain, Turner, Mivart, Macalister, &c.; of Physiology by Foster, Huxley, Landois and Stirling, &c.

DISEASES OF THE HEART are either those affecting the various tissues composing the heart, or the nervous arrangements governing the heart.

(1) *Diseases of Structures composing Heart* may be primary or secondary.

(*a*) *Primary Diseases.* All the various tissues of the heart may be primarily affected. The *Pericardium* (sac surrounding heart) may be affected with inflammation (*pericarditis*). This is by no means an uncommon condition in rheumatic fever, while it also occurs in connection with some of the acute exanthemata. Fluid tends to be effused into the sac, and this produces great impairment of the heart's action. The condition frequently leads to a fatal termination. Various *tumours* may occur in connection with the pericardium.

The *Myocardium* (muscular wall of heart) may also be affected with inflammation leading to very irregular and impaired action of the heart, and often to death. This is known as *myocarditis*, and if the fatal termination does not ensue in the acute stage of the disease, the wall of the heart is apt to be left in a weakened condition due to the pathological changes set up in the course of the inflammation. The myocardium may occasionally be the seat of tumours. The muscular substance of the heart may undergo a *fatty degeneration*, which may produce death either from failure of the heart, or more rarely by rupture of the wall.

The *Endocardium* (lining membrane of heart; also forms the valves of the heart) is the most common seat of inflammation in rheumatic subjects and in individuals suffering from scarlet fever or from some other of the exanthemata. This *endocarditis* is specially apt to attack the valves of the left side of the heart, and to lead to deformity and the imperfect action of these important structures. When this occurs the well-known train of symptoms commonly associated with heart disease are apt to appear—breathlessness, palpitations, irregular heart's action, dropsy, albuminuria, &c.; while the various signs of valvular disease, among the most important of which is the alteration in the sounds of the heart, and the development of murmurs may also be determined. In many cases, however, in spite of disease of the valves, the heart may continue to act satisfactorily. But there is always a great danger of its proving inadequate to the additional work thus put upon it, and of its suddenly failing under any extra strain.

There is one peculiar form of inflammation of the endocardium known as *acute ulcerative endocarditis* which is exceedingly fatal, and which is due to the development of micro-organisms in the heart. Certain slow degenerative changes may also affect the endocardium, more especially where it composes the aortic valves (*Atheroma*).

In all inflammatory affections of the heart there is a tendency for all the structures to be involved at one and the same time.

(*b*) *Secondary Diseases.*—As the result of various morbid states of other parts of the body, the heart, and more especially its muscular wall, may become secondarily affected. Thus in *fever* the muscular substance of the heart manifests the condition of *cloudy swelling*, and thus becoming weakened tends to yield to the pressure of blood inside the heart, and to undergo dilatation. This state of the organ is frequently accompanied by the develop-

ment of murmurs due to the imperfect action of the valves between the auricles and ventricles allowing the blood to flow backwards through the orifices. At the same time the various symptoms of disturbed circulation are developed.

In the various forms of *anæmia* (bloodlessness), whether primary or secondary to other diseases, the muscle of the heart becomes debilitated, and a similar series of signs and symptoms to those just described make their appearance.

In certain diseases in which the blood pressure is raised (Bright's Disease), or when any condition throws extra work on the heart for a considerable period, the organ becomes *hypertrophied*—i.e. increased in size and strength. This is well seen when the valves are diseased, and the muscular substance is well nourished.

(2) *Derangements of Nervous Mechanism of Heart.* As a result of many totally different conditions the sensory nervous mechanism of the heart may be affected, and give rise to pain or to various sensations in the region of the heart. These sensations are not, however, always indicative of organic disease of the organ.

A peculiar set of symptoms, known as *angina pectoris*, are treated more fully under a separate head. The patient suffers from attacks, the chief symptom of which is a dreadful feeling of impending death, usually with cardiac pain. When occurring as the result of organic heart disease these symptoms are most commonly connected with disease of the aortic valves.

The various nervous arrangements presiding over the movements of the heart may also become deranged, and lead to increased or diminished heart's action or to irregular action. The last is the most frequent, and is a very common accompaniment of organic disease, though it frequently occurs in individuals entirely free of any such condition. Nervous and gouty individuals and those addicted to the excessive use of tobacco are common sufferers from such *palpitations*.

The words 'broken heart' seem to suggest a form of heart disease. But of course the expression arose out of the long prevalent and now wholly obsolete view that the heart is in some way the seat of the affections—a view inevitably suggested by the quickening of the pulse under emotion, or its temporary stoppage from a sudden shock.

Heart, Sacred. See Sacred Heart.

Heart-burial, or the burial of the heart in a place separate from that in which the body is laid, seems to have been once practised by the ancient Egyptians. In European countries it was most common in the 12th and 13th centuries, though instances have occurred in all centuries down to and including the 19th. The practice undoubtedly arose out of the special veneration in which the heart was held as the seat of the affections and of certain of the higher virtues, as courage, piety. Besides the heart, other parts of the body, such as the viscera, were sometimes honoured with separate burial. It has been suggested that this distribution of the body for sepulture was prompted by a wish to secure the prayers of more than one congregation for the soul of the deceased. In other instances, where the deceased has died abroad and his heart has been carried home for burial, the motive is simpler to understand. The persons who have been honoured with separate burial for the heart have been for the most part men and women of royal birth and ecclesiastics of high rank. Amongst royal personages may be enumerated Henry I. and Richard I. of England, whose hearts were interred at Rouen; Henry III., whose heart was buried at Fontevraud in Normandy; Eleanor, wife of Edward I., at Lincoln; Edward I. himself, whose heart was sent to Jerusalem for burial, as was that of Robert Bruce (q.v.); the French kings, Louis XII., XIII., and XIV., Francis I. and II., and Henry II. and III.; the Emperor Leopold of Austria; and James II. of England, whose heart was entombed in St Mary of Chaillot near Paris. The heart of Anne de Montmorency, constable of France, was interred at Les Célestins; that of Lord Edward Bruce at Culross Abbey in Perthshire, his body in Bergen-op-Zoom in Holland; and that of Sir William Temple at Moor Park near Farnham. The viscera of the popes from Sixtus V. (1590) onwards were interred in SS. Vincenzo and Anastasio, the parish church of the Quirinal. Daniel O'Connell's heart is buried at Rome; Shelley's '*cor cordium*' at Bournemouth; and that of the French marshal, Kellermann, on the battlefield of Valmy. The practice was prohibited by Pope Boniface VIII. (1294–1303); but the prohibition was removed by Benedict XI., at all events so far as the French royal family was concerned. The Marquis of Bute's heart was carried to Jerusalem and buried on the Mount of Olives in November 1900. See Pettigrew, *Chronicles of the Tombs* (1857), pp. 249 *et seq.*

Heart-burn. See Indigestion.

Hearth-money, an unpopular tax of two shillings levied on every hearth in all houses 'paying to church and poor;' first imposed in 1663, and abolished in 1689.

Heart's Content, a port of Newfoundland, on the east side of Trinity Bay, with 900 inhabitants. Two Atlantic cables land here.

Heart's-ease. See Violet.

Heat, the cause of the sensation of warmth, and of a multitude of common phenomena in nature and art. In considering this subject scientifically it is necessary from the outset to discard the ideas conveyed by the popular use of such words as hot and cold. A number of bodies, however different, left for a long enough time in the same room, must, as we shall see further on, acquire the same *temperature*, or become in reality equally warm. Yet in popular language some, as metals, stones, &c., are pronounced to be cold, and others, as flannel and fur, warm. The touch, then, is *not* a means by which we can acquire any definite idea of the temperature of a body.

Nature of Heat. A heated body is no heavier than it was before it was heated; if, therefore, heat be a material substance, as it was long considered, it must be *imponderable*. And, in fact, under the name of caloric, it is classed in almost all but modern treatises as one of the family of imponderables. But if it were *matter*, in any sense of the word, its quantity would be unchangeable by human agency. Now we find that there are cases in which heat is produced in any quantity without flame, combustion, &c., as in melting two pieces of ice by rubbing them together, and also cases in which a quantity of heat totally disappears. This is utterly inconsistent with the idea of the materiality of heat. The only hypothesis that at all accords with the phenomena is that *heat depends upon motion of the particles of a body*, being in fact Energy (q.v.), not matter; and with this idea we shall start.

Temperature.—When two bodies are placed in contact, heat will in general pass from one to the other, with the effect of cooling the first and warming the second. This process goes on until the two acquire the same temperature. Thus temperature is a condition of a body, determining, as it were, the *head* of the heat which the body contains—to take the obvious analogy of water in a cistern or a mill-pond. In this sense it is analogous also to the pressure of gas in a receiver, or to the potential in

an electrified conductor. By the help of the 'specific heat' of bodies (which will be treated later) we can determine from their change of temperature how much heat they gain or lose. The scientific or *absolute* measurement of temperature can only be alluded to here. It depends upon theoretical considerations, for which see THERMO-DYNAMICS.

Measure of Heat. Whether it be a vibration, such as light and sound (as in some cases it certainly is), or consist in independent motions of the particles of a body, leading to a succession of *impacts* on each other and on the walls of the containing vessel (as is almost certainly the case in gases), it is none the less certain that the *amount* of heat in a body is to be measured by the energy of moving particles. But as we cannot observe those particles so as to ascertain their vis-viva, we must have as a preliminary some artificial unit in terms of which to measure heat. This will be described later. But in order that this process may be applied we must have some means of measuring the temperature of a body, depending upon an *effect* of heat. Whatever that effect may be, it is obvious that, as the laws of nature are uniform, it will afford us a *reproducible* standard, by which we can estimate at any time and at any place an amount of heat, and compare that amount with another observed somewhere else; just as the French Mètre (q.v.) is reproducible at any time, being (at least by its original definition) the ten-millionth part of a quadrant of the meridian.

Dilatation or Expansion.—Now, one of the most general and notable effects which heat produces on matter is to *expand* it. The length of a metallic bar varies with every change of temperature, and is ever the same at the same temperature. The fixing of the tire of a cart-wheel is a very good instance. No hammering could fit an iron hoop so tightly on the wood-work of the wheel as does the simple enlarging of the tire by heat, and its subsequent contraction by cold. It is thus possible to *slip* it on, and an enormous force is secured to bind the pieces together. In almost every kind of structure the expansion and contraction from changes of temperature require to be guarded against. In the huge iron tubes of the Britannia Bridge the mere change of the seasons would have produced sufficient changes of length to tear the piers asunder, had each end of a tube been fixed to masonry. Watches and clocks, when not compensated (see PENDULUM), go faster in cold weather, and slower in hot, an immediate consequence of the expansion or contraction of their balance-wheels and pendulums.

If a flask *full* of water or of alcohol be dipped into hot water or held over a lamp, the flask is heated first, and for a moment appears not quite full, but as heat reaches the liquid it expands in turn, and to a greater degree than the flask, so that a portion of the liquid runs over; a glass shell which just floats in a vessel of water, sinks to the bottom when the water is heated; and as water is gradually heated from below, the hotter water continually rises to the surface. Indeed, if this were not the case, it would be impossible to prevent explosions every time we attempted to boil water or any other fluid. If a bladder, partly filled with air, and tightly tied at the neck, be heated before a fire, the contained air will expand, and the bladder will be distended. As it cools it becomes flaccid again by degrees.

These and like instances are sufficient to show us that *in general* all bodies expand by heat. In order, then, to prepare a reproducible means of measuring temperature, all we have to do is to fix upon a substance (mercury is that most commonly used) by whose changes of volume it is to be measured, and a reproducible temperature, or rather two reproducible temperatures, at which to measure the volume. Those usually selected are—that at which water freezes, or ice melts, and that at which water boils. In both of these cases the water must be *pure*, as any addition of foreign matter in general changes the temperature at which freezing or boiling takes place. Another important circumstance is *the height of the barometer* (see BOILING). The second reproducible temperature is therefore defined as that of water boiling in an open vessel when the barometer stands at 30 inches. In absolute strictness, this should also be said of the freezing-point, but the effect on the latter of a change of barometric pressure is practically insensible. The practical construction of a heat-measurer or *thermometer* on these principles, the various ways of graduating it, and how to convert the readings of one thermometer into those of another, are described in the article THERMOMETER. In the present article we suppose the Centigrade thermometer to be the one used.

If we make a number of thermometer tubes, fill them with different liquids, and graduate as in the Centigrade, we shall find that, though they all give 0° in freezing and 100° in boiling water, no two in general agree when placed in water between those states. *Hence the rate of expansion is not generally uniform for equal increments of temperature.* It has been found, however, by very delicate experiments, which cannot be more than alluded to here, that mercury expands *nearly* uniformly for equal increments of temperature. However, what we sought was not an *absolute* standard, but a *reproducible* one; and mercury, in addition to furnishing this, may be assumed also to give us approximately the ratios of different increments of temperature.

We must next look a little more closely into the nature of dilatation by heat. And first, of its *measure*. A metallic rod of length l at 0° increases at $t°$ by a quantity which is proportional to t and to l. Hence, k being some numerical quantity, the expanded length $l' = l(1 + kt)$. Here k is called the coefficient of linear dilatation. For instance, a brass rod of length 1 foot at 0° becomes at $t°$ $(1 + \cdot0000187t)$ feet; and here k, or the coefficient of linear dilatation for one degree (Centigrade), is $\cdot0000187$; or a brass rod has its length increased by about one fifty-three thousandth part for each degree of temperature.

If we consider a bar (of brass, for instance) whose length, breadth, and depth are l, b, d—then, when heated, these increase proportionally. Hence

$$l' = l(1 + kt),$$
$$b' = b(1 + kt),$$
$$d' = d(1 + kt),$$

and therefore the volume of, or space occupied by, the bar increases from V or lbd to V′ or $l'b'd'$.

Hence $V' = V(1 + kt)^3$,
$= V(1 + 3kt)$ nearly, since k is *very small*.

Therefore we may write $V' = V(1 + Kt)$, where we shall have as before K, the coefficient of *cubical* dilatation for 1° of temperature. And, as $K = 3k$, we see that, for the same substance, the *coefficient of cubical dilatation is three times that of linear dilatation*.

In the following table these coefficients are increased a hundredfold, as it gives the proportional increase of length for a rise of temperature from 0° to 100° Centigrade. It must also be remarked that, while the *linear* dilatation of solids is given, it is the cubical dilatation of liquids and gases which is necessarily given. Moreover, as the latter are always measured in glass, which itself dilates, the results are only *apparent*; they are too small, and require correction for the cubical dilatation of glass. This, however, is comparatively very

small, and a rough approximation to its value is usually sufficient.

Glass	·0198	Water	·0482
Iron	·1098	Alcohol	·1103
Zinc	·0955	Air	·2669
Mercury	·0306	Hydrogen	·3405

There is one specially remarkable exception to the law that bodies expand by heat—viz. that of water under certain circumstances. From 0° (Centigrade), at which it melts, it *contracts* as the temperature is raised, up to about 4° C., after which it begins to expand like other bodies. We cannot here enter into speculations as to the cause of this very singular phenomenon, but we will say a few words about its practical utility. Water, then, is *densest* or *heaviest* at 4° C. Hence, in cold weather, as the surface water of a lake cools to near 4°, it becomes heavier than the hotter water below, and sinks to the bottom. This goes on till the whole lake has the temperature 4°. As the surface-cooling proceeds further, the water becomes *lighter*, and therefore remains on the surface till it is frozen. Did water not possess this property, a severe winter might freeze a lake *to the bottom*, and the heat of summer might be insufficient to remelt it all.

Specific Heat. The thermometer indicates the *temperature* of a body, but gives us no direct information as to the *amount* of heat it contains. Yet this is measurable, for we may take as our UNIT the amount of heat required to raise a pound of water from 0° to 1°, which is of course a definite standard. As an instance of the question now raised—Is *more* heat (and if so, *how much more*) required to heat a pound of water from zero to 10° than to heat a pound of mercury between the same limits? We find by experiment that bodies differ extensively in the amount of heat (measured in the units before mentioned) required to produce equal changes of temperature in them.

It is a result of experiment (sufficiently accurate for all ordinary purposes) that, if equal weights of water at different temperatures be mixed, the temperature of the mixture will be the arithmetic mean of the original temperatures. From this it follows, with the same degree of approximation, that equal successive amounts of heat are required to raise the same mass of water through successive degrees of temperature. As an instance, suppose one pound of water at 50° to be mixed with two pounds at 20°, the resulting temperature of the mixture is 30°; for the pound at 50° has lost 20 heat units, while each of the other two pounds has gained 10 such units, transferred of course from the hotter water. Generally, if m pounds of water at t degrees be mixed with M pounds at T degrees (the latter being the colder), and if θ be the temperature of the mixture—the number of units lost by the first is $m(t-\theta)$, since *one* is lost for *each* pound which cools by *one* degree; and that gained by the second is $M(\theta - T)$, and these must be equal. Hence $m(t-\theta) = M(\theta - T)$; whence, at once,

$$\theta = \frac{mt + MT}{m + M}.$$

But if we mix water and mercury at different temperatures, the resulting temperature is found *not* to agree with the above law. Hence it appears that *to raise equal weights of different bodies through the same number of degrees of temperature requires different amounts of heat.* And we may then define the *specific heat* of a substance as the number of units of heat (as above defined) required to raise the temperature of *one* pound of it by *one* degree.

From the definition of a unit of heat it is at once seen that our numerical system is such that the specific heat of water is unity; and, in general, the specific heats of other bodies are less, and are therefore to be expressed as proper fractions. For example, if equal weights of water and mercury be mixed, the first at 0°, the second at 100°, the resulting temperature will not be 50° (as it would have been had both bodies been water), but 3°·23 nearly; in other words, the amount of heat which raises the temperature of one pound of water 3°·23 is that which would raise that of one pound of mercury 96°·77, or the specific heat of mercury is $\frac{1}{30}$th of that of water. The following may be given as instances of the great differences which experiment has shown to exist among bodies in respect of specific heat: Water, 1·000; turpentine, ·426; sulphur, ·203; iron, ·114; mercury, ·033.

It is mainly to the great specific heat of water that we are indebted for the comparatively small amount of it required to cool a hot body dropped into it; for its comparatively small loss of temperature when it is poured into a cold vessel; and for the enormous effects of the water of the ocean in modifying climate, as by the Gulf Stream.

It has been found generally that the specific heats of elementary solids are nearly *inversely* as their Atomic Weights (q.v.). *Hence their atoms require the same amount of heat to produce the same change in their temperature.* Thus, for simple bodies, we have atomic weight of mercury, 100; its specific heat, ·033; product, 3·3; atomic weight of iron, 28; its specific heat, ·114; product, 3·2. A similar remark may be made, it appears, with reference to compound bodies of any one type; but, in general, the product of the specific heat and the atomic weight differs from one type to another.

Latent Heat, Fusion, Solution, and Vaporisation.—We are now prepared to consider the somewhat complex effects produced by heat on the molecular constitution of bodies; and, conversely, the relations of solidity, fluidity, &c. to heat. All solid bodies (except carbon, which has been *softened* only) have been melted by exposure to a sufficiently high temperature. The laws of this fusion are:

(1) *Every body has a definite melting point, assignable on the thermometric scale, at the pressure to which it is subjected to the same.*

(2) *When a body is melting, it retains that fixed temperature, however much heat may be supplied, until the last particle is melted.* The last result is most remarkable. The heat supplied does not raise the temperature, but *produces the change of state.* Hence it seemed to disappear, as far as the thermometer is concerned, and was therefore called *latent* heat.

A pound of water at 79° C. added to a pound of *water* at 0° C. produces, of course, two pounds of water at 39°·5. *But* a pound of water at 79° C. added to a pound of *ice* at 0° C. produces two pounds of water at 0°. Heat, then, has *disappeared* in the production of a change from solidity to fluidity. And this we might expect from the conservation of Energy (q.v.), for energy in the shape of heat must be consumed in producing the potential energy of the molecular actions of the separate particles in the fluid. For every pound of ice melted, without change of temperature, 79 units of heat are thus converted into potential energy of molecular separation.

We give a few instances of latent heat of fusion: Water (as above), 79·0; zinc, 28·1; sulphur, 9·4; lead, 5·4; mercury, 2·8.

In law 1 it is mentioned that constancy of pressure is necessary. In fact, the freezing (or melting) point of water is *lowered* by increase of pressure, while those of sulphur or wax are *raised;* but these effects, though extremely remarkable, are *very small.* Most bodies contract on solidifying; but some, as water, cast-iron, certain alloys, &c., *expand.* Thus a severe frost, setting in after

copious rain, splits rocks, &c., by the expansion of freezing water; and thus also we obtain in iron the most delicate and faithful copy of a mould, and in the fusible alloy a clear-cut copy of a type. The modern dynamical theory of heat (thermo-dynamics) enables us to see that a perpetual motion would be procurable if bodies which contract on solidifying had *not* their melting-point raised by pressure, and *vice versâ*.

Analogous to the fusion of a solid is its *solution* in a liquid, or the mutual conversion into liquids of two solids which are intimately mixed in powder. Here, also, we should expect kinetic energy, in the shape of heat, to be used up in producing the potential energy of the liquid state; and, indeed, such is always the case. Such changes of arrangement destroy heat or produce cold; but this in many cases is not the effect observed, as there is generally heat developed by the *loss* of potential energy if there be *chemical* action between the two substances. Hence, in general, the observed effect will be due to the difference of the heat *generated* by chemical action and that *absorbed* in change of state.

If a quantity of pounded nitrate of ammonia (a very soluble salt) be placed in a vessel, an equal weight of water added, and the whole stirred for a minute or two with a test-tube containing water, the heat required for the solution of the salt will be abstracted from all bodies in contact with the solution, and the water in the test-tube will be frozen. In this sense the arrangement is called a *freezing mixture*. For additional illustrations of heat becoming latent, see FREEZING MIXTURES.

Of course the converse of this may be expected to hold, and latent heat to become sensible when a liquid becomes solid. As an example, when a supersaturated solution of sulphate of soda begins to deposit crystals of the salt with great rapidity the temperature rises very considerably; and it is the disengagement of latent heat that renders the freezing of a pond a slow process, even after the whole of the water has been reduced nearly to the freezing-point.

Vaporisation.—Almost all that has been said on the subject of fusion is true of vaporisation, with the change of a word or two. Thus, however much heat we supply to a liquid, the temperature does not rise above the boiling-point. Heat, then, becomes *latent* in the act of vaporisation, or rather is *converted into* the potential energy involved in the change of state. It is found by experiment that 540 units of heat (each sufficient to heat a pound of water 1° C.) disappear in the conversion of a pound of water into steam. Hence a pound of steam at 100° C. is sufficient to raise 5·4 pounds of water from zero to the boiling-point.

COMMUNICATION OF HEAT.—There are at least three distinct ways in which this occurs, and these we will take in order.

Conduction.—Why is it that, if one end of a poker and of a glass or wooden rod be put into a fire, we can keep hold of the other end of the latter much longer than we can of the former? The reason is that heat is more readily transmitted in the iron from particle to particle than it is in glass or wood. This is conduction. It is to be noticed, however, that in this experiment a great portion of the heat which passes along each rod is given off into the air by the surface. The mathematical theory of conduction has been most exquisitely investigated by Fourier, but on the supposition that the rate at which heat passes from a warmer to a colder portion of a body is proportional to the *difference* of temperature. As most of the experiments which have been made with the object of ascertaining the *conductivity* (*not* conductibility, the erroneous word too commonly in use) of different bodies have been made in this way, it is not surprising that our knowledge on this point is very meagre indeed. We know that silver and copper conduct better than most other metals, and that the metals in general conduct better than other solids; but our further information is neither very extensive nor very definite. The first determinations of conductivity which are at all trustworthy are those of Forbes. His method was immensely superior to those of his predecessors. Before we give one or two numerical data, we must explain what the numbers mean. The following definition is virtually that of Fourier:

The thermal conductivity of a substance is the number of units of heat which pass per unit of surface per unit of time, through a slab of unit thickness, whose sides are kept at temperatures differing by 1° C. Taking the unit of heat as above described, a foot as unit of length and a minute as unit of time, the conductivity of iron is about 0·8, while that of copper varies from 4 to little more than 2. (Very slight impurities affect to a great extent both the thermal and the electric conductivity of copper.) Contrasted with these we find that the conductivity of rocks is very small, ranging from 0·015 to 0·04.

In conjunction with their radiating power (see next section), the conductivity of bodies is most important as regards their suitableness as articles of clothing for hot or cold climates, or as materials for building or furnishing dwelling-houses. We need but refer to the difference between linen and woollen clothing, or to the difference (in cold weather) of sensation between a carpet and a bare floor, in order to show how essential the greater or less conducting power of bodies is to our everyday comfort.

Radiation.—By this is understood the passage of heat, not from particle to particle of one body, but through air or vacuum, and even through solid bodies (in a manner and with a velocity quite different from those of conduction) from one body to another. There can be no doubt whatever as to radiant heat being *identical* with light, differing from red light, for instance, as red light differs from blue—i.e. having (see LIGHT) longer waves than those corresponding to red light. This idea might easily have arisen during the contemplation of a body gradually heated. At first it remains dark, giving off only rays of heat; as its temperature increases it gives us, along with the heat, a low red light, which, by the increase of the temperature, is gradually accompanied by yellow, blue, &c. rays, and the incandescent body (a lime-ball, for instance) finally gives off a light as white as that of the sun, and which therefore contains all the colours of sunlight in their usual proportions. In fact there is great reason to believe that the sun is merely a mass of incandescent matter, probably in the main gaseous, and that the radiations it emits, whether called heat or light, merely differ in *quality*, not in *kind*. Taking this view of the subject at the outset, it will be instructive to compare the properties of radiant heat with those of light throughout. It must be understood when we make this comparison that the term *heat* is improperly used in this connection. Radiant heat is not heat in the ordinary sense of the word. It is a form of energy, a *transformation* of the heat of a hot body, and can be transformed into heat again when it is absorbed, but on its passage it is not what we ordinarily understand by the word heat.

Light, then, *moves* (generally) *in straight lines*. This is easily verified in the case of heat by the use of the thermo-electric pile and its galvano

meter. Placing the pile *out* of the line from a source of heat to an aperture in a screen, *no* effect is observed; but deflection of the needle at once occurs when the pile is placed in the line which light would have followed if substituted for the heat.

A concave mirror, which would bring rays of light proceeding from a given point to a focus at another given point, does the same with heat, the hot body being substituted for the luminous one, and the pile placed at the focus. Heat, then, is *reflected* according to the *same laws* as light. A burning lens gives a capital proof of the sun's heat and light being subject to the same laws of *refraction*. When the solar Spectrum (q.v.) is formed by means of a prism of rock-salt (the reasons for the choice of this material will afterwards appear), the thermo-electric pile proves the existence of heat in all the coloured spaces, increasing, however, down to the red end of the spectrum, and attaining its maximum *beyond* the visible light, just as if radiant heat were (as it *must* be) light with longer waves.

Some bodies, as glass, water, &c., transmit, when in thin plates, most of the light which falls on them; others, as wood, metal, coloured glass, &c., transmit none or little. A plate of rock-salt, half an inch thick, transmits 96 per cent. of the rays of heat which fall on it; while glass, even of a thickness of one-tenth of an inch, transmits very little. In this sense, rock salt is said to be *diathermanous*, while glass is said to be adiathermanous, or only partially diathermanous. Most of the simple gases, such as oxygen, hydrogen, &c., and *mixtures* of these, such as air, oppose very little resistance to the passage of radiant heat; but the reverse is in general the case with compound gases. It has recently been asserted that water-vapour in particular is exceedingly adiathermanous. The question is one of very considerable difficulty, owing to the fact that it is almost impossible to experiment upon vapour alone. The presence of dust particles always produces deposition of *water*, which is a very good absorber of radiant heat.

But there are other remarkable phenomena of radiant heat which are easily observed, and which have their analogy in the case of light. (1) Unstained glass seems equally transparent to all kinds of light. Such is the case with rock-salt and heat. (2) Light which has passed through a blue glass (for instance) loses far less per cent. when it passes through a second plate of blue glass. Similarly heat loses (say) 75 per cent. in passing through *one* plate of crown-glass, and only 10 per cent. of the remainder (say) in passing through a second. (3) Blue light passes easily through a *blue* glass, which almost entirely arrests red light. So dark heat passes far less easily through glass than bright heat does. These analogies, mostly due to Melloni, are very remarkable.

Again, light can be *doubly refracted*, *plane polarised*, *circularly polarised*. All these properties have been found in radiant heat by Principal Forbes.

The beautiful investigations of Stokes, Balfour Stewart, and Kirchhoff have shown us that bodies which most easily *absorb* light of a particular colour give off most freely, when heated, light of that colour; and it is easily shown by experiment that those surfaces which absorb heat most readily also radiate it most readily. Thus, it was found by Leslie that when a tinned-iron cube full of boiling water had one side polished, another roughened, a third covered with lampblack, &c., the polished side radiated little heat, the roughened more, while the blackened side radiated a very great quantity indeed. And again, that if we have (say) three similar thermometers, and if the bulbs be (1) gilded, (2) covered with roughened metal, (3) smoked, and all be exposed to the same radiation of heat, their sensibility will be in the order 3, 2, 1. A practical illustration of this is seen in the fact that a *blackened* kettle is that in which water is most speedily made to boil, while a polished one keeps the water longest warm when removed from the fire. Again, if a willow pattern plate be heated white-hot in the fire, and then examined in a dark room, the pattern will be reversed—a white pattern being seen on a dark ground. It is this law of equality of radiating and absorbing powers that mainly gives rise to the superior comfort of white clothing to black in winter as well as in summer; radiating less in winter, it absorbs less in summer.

Much has been argued about the separate existence of *cold*, from such facts as these: A piece of ice held before the thermo-electric pile produces an opposite deflection of the galvanometer to that produced by a hot ball. If a freezing mixture be placed at one focus of a spheroidal mirror, and a thermometer with a blackened bulb at the conjugate focus, the latter will fall speedily, though very far off from the mixture. Now, the true explanation of such observations is to be found in what is called the 'Theory of Exchanges,' first enunciated by Prévost, and since greatly extended and carefully verified by Stewart, which is to this effect: 'Every body is continually radiating heat in all directions, the amount radiated being greater as the temperature is higher.' Thus the radiation from a body depends on *itself* alone, the amount absorbed depends on the radiation which reaches it. Hence the apparent radiation of cold in the experiments above mentioned is due to the fact of the pile or thermometer *radiating off more heat than it receives*, as its temperature is higher than that of the freezing mixture to which it is opposed. From this it is evident that any number of bodies left near each other tend gradually to assume a common temperature. By this theory of exchanges we explain the cold felt in sitting opposite an open window in a frosty day, even when there is no draught.

Convection.—A hot body cools faster in a current of air than in a still atmosphere of the same temperature, evidently because fresh supplies of the colder air are continually brought into contact with it. This carrying off of its heat by a stream of air is an example of convection. It is by convection mainly that heat is conveyed throughout liquids and gases. Thus, when a lamp is applied to the bottom of a vessel of water the heat does not diffuse itself in the water as it would (by conduction) in a mass of metal, but the expansion of the heated water at the bottom rendering it lighter, bulk for bulk, than the superincumbent fluid, causes it to rise to the surface; and thus, by convection, the heat is diffused through the mass. Conduction, properly so called, can scarcely be shown, though it really exist, in liquids or gases, on this account. The tremulous appearance of any object as seen by light which passes near a hot surface, as that of a boiler or a red-hot poker, is due to the convection of heat in the air, the warm

current refracting light less than does the cold air. See VENTILATION.

For the mechanical applications of heat, see AIR-ENGINE, STEAM-ENGINE, &c., and for their theory, see THERMO-DYNAMICS.

Sources of Heat.—They may be, so far as we know, ultimately reduced to two—chemical combination and mechanical energy; and, indeed, in all probability the former is only a variety of the immensely different forms in which the latter is manifested. A more full examination of this point, and a general statement of the ultimate nature of the various sources of heat, will be found in the article ENERGY above referred to. See also COMBUSTION, FUEL; and for heating apparatus, see WARMING.

Heath (*Erica*), a genus of small shrubs of the natural order Ericeæ, distinguished by a calyx of four leaves, a bell-shaped or ovate—often ventricose—corolla, and a 4-celled, 4 S-valved capsule. The leaves are small, linear, and evergreen. The genus consists of about 400 species,

Heaths.

besides innumerable hybrids and varieties raised in gardens. The home of the genus is in the western part of South Africa, but a few species are distributed over western and northern Europe. *E. vulgaris*—now generally named by botanists *Calluna vulgaris* (fig. 1)—is the most widely distributed of all heaths, extending as it does over central and northern Europe to the Arctic Circle. It is the ling, heath, or heather of British moors and mountains. The genus is not found in Asia, America except in Labrador, Cape Breton, Nova Scotia, and parts of New England, where the common heath occurs—nor in Australia. Six species, including the ling, are found in the British Isles.

Cross-leaved Heather (*E. tetralix*) (fig. 2) and Fine-leaved Heather (*E. cinerea*) (fig. 3) are common plants in most parts of Britain, and, like most of the genus, are very beautiful when in flower. The *heather-bells* of Scottish song are the flowers of one or both of these species. A sprig of *E. cinerea* was the badge of the Macdonalds at the time when they existed as a distinct clan. *E. carnea*, common in the southern parts of Europe, is a very frequent ornament of British flower-borders. Many species, remarkable for the size and beauty of their flowers, are much cultivated in greenhouses. Some of the south African or Cape heaths attain in their native region a much greater size than any European heath except *E. arborea*, which in the Pyrenees sometimes grows to the height of 20 feet. The so-called Briar-root (q.v.) of which tobacco-pipes are made is a heath.

In the Highlands of Scotland the common heath served in former times a great variety of purposes. The poorer folks formed walls for their cottages with alternate layers of heath and a kind of mortar made of earth and straw, and they made comfortable if not luxurious beds of it, placing the roots downwards, and laying the plants in a sloping direction. With heath cottages are also thatched, besoms are made, and faggots are formed to burn in ovens. In the island of Islay ale was made by brewing one part of malt with two of the young tops of the common heath, and this liquor, according to Boece, was used by the Picts. Sheep and goats sometimes browse on the tender shoots, but they do not like them. The young tops form almost exclusively the food of grouse. From the flowers bees extract a great quantity of honey, which is of a very deep colour.

Heathfield. GEORGE AUGUSTUS ELLIOTT, LORD, the heroic defender of Gibraltar, was the tenth son of Sir Gilbert Elliott, third Bart. of Stobs, and was born at Wells House in Roxburghshire, on Christmas-day 1717. Having been educated at the university of Leyden, and at the French military college of La Fère and at Woolwich, he had his first experience of actual warfare in the war of the Austrian succession, in which he was wounded at Dettingen and fought at Fontenoy. Having been gazetted colonel of a regiment of light horse in 1759, he served at its head with the English contingent that assisted Frederick the Great against Austria in the years 1759 to 1761. In the following year he went out to Cuba as second in command under the Earl of Albemarle, and returned home with the rank of lieutenant-general. When, after the outbreak of the war with the American colonies, Great Britain became involved in hostilities with Spain as well, Eliott was sent out to put Gibraltar in a state of defence. His obstinate and heroic defence of this stronghold, from June 1779 to February 1783, against all the power of Spain, ranks as one of the most memorable achievements of British arms (see GIBRALTAR). On his return home he was in 1787 raised to the peerage as Lord Heathfield, Baron of Gibraltar—Heathfield being a Sussex estate which he had purchased in 1763. He died at Aix-la-Chapelle, 6th July 1790. Drinkwater's *History of the Siege of Gibraltar* is one of the best accounts of military heroism ever written.

Heaven, in its theological sense, is that portion of the infinite space in which the Lord of all things, though present throughout all, is supposed to give more immediate manifestations of his glory. It is also the place, or the state or condition, of the blessed spirits, and of the souls of just men made perfect who are admitted into the participation or the contemplation of the divine beatitude. It is the special seat of the glory of the Most High, in which his angels minister to him, and the blessed spirits abide in perpetual praise and adoration. In the Scriptures the word is used in various senses: (1) for the region of the atmosphere; (2) sometimes for the region of the stars—the hosts of heaven; (3) as a state of blessedness attainable even here, as in Eph. ii. 6, where it is said 'God hath raised us up together (with Christ), and made us sit together in heavenly places;' and also in Phil. iii. 20, where the conversation of the saints while yet on earth is said to be 'in heaven;' (4) as the place where God dwells, where the angels and the spirits of the saints are congregated, whence Christ came and whither he has returned (John, xiv. 2, &c.). Many of the saints of Christendom in moments of ecstatic elevation of spirit have

believed that glimpses into heaven have been vouchsafed to them, but their accounts of these visions have usually been but incongruous and contradictory. The figurative language in which its unseen glories are described in Scripture has made such an excitation of fancy the more easy for devout souls rapt in profound meditation about what it has not been given to the eye of man to see nor the heart to conceive.

Aristotle declares that all men have a conception of gods, and that all agree in placing their habitation in the most elevated region of the universe. The Egyptian, the Scandinavian, the Assyrian, and all primitive religions maintain the existence of a heaven as the place of reward after death for virtuous lives lived on earth; and indeed it may be taken as the universal corollary to the universally held belief in the immortality of the soul, even though it may be only under the form of the final stage in a cycle of purificatory transmigrations. But among primitive peoples it is little more than a dim and shadowy continuation of this present world, the pale ghosts that inhabit it wearing the form and fashion that they wore in life. The idea of future retribution enters early into the moral consciousness of man, but it would hardly be true to say that it is everywhere present. The Teutonic warrior had his war-horse and his armour laid in his barrow that he might continue into the spirit world the joys of life, his Valhalla being but a glorified extension of the warrior's life, just as the Red Indian's paradise is but a richer and more extensive hunting-ground. Yet the unseen life is often but poor and cheerless compared with the warm and actual world—even in the Elysian fields the shade of Achilles would gladly change places with the meanest soldier in the Grecian host.

The Koran adopts the Cabbalistic notion of seven heavens, which rise above each other like the stages of a building; and it places the chief happiness of heaven in the unrestricted and inexhaustible joys of sense. The Cabbalistic writers divide these seven heavens according to the successive degrees of glory which they imply. The seventh is the abode of God and of the highest order of angels; the sixth, fifth, fourth, and third are the successive abodes of the various grades of angels, arranged according to the degrees of dignity. The second is the region of the clouds, and the first the space between the clouds and the earth.

For the development of Jewish and Christian Eschatology, and the significance of the conception of heaven, see the article HELL, under which the subject of future rewards and punishments is discussed with some fullness.

Hebbel, FRIEDRICH, lyrical and dramatic poet, was born at Wesselburen, in Dithmarsh, 18th March 1813. After travelling in Germany, France, and Italy, he settled at Vienna in 1846, where he married the actress Christine Enghaus. He died at Vienna, 13th December 1863. His principal works are his *Gedichte* (2 vols. 1841–48), and several dramas, the best among them being *Judith* (1840), *Maria Magdalena* (1844), *Agnes Bernauer* (1855), *Gyges und sein Ring* (1856), and his masterpiece, *Die Nibelungen* (1862). Hebbel had strong dramatic talent, skill in drawing character, and command of vigorous language, but no feeling for beauty. His dramas are destitute of love and joyousness; they depict the revolt of passionate natures, the frenzied riot of evil desires, and are characterised by an almost daemonic vigour of action. His collected works appeared in 12 vols. (Hamburg) in 1866–68. See Biographies by Kuh (1877) and Frankl (1884), and Hebbel's *Tagebücher* (2 vols. 1887).

Hebe, the goddess of youth, the daughter of Zeus and Hera, was the wife of Hercules after he had been deified. She was the cupbearer in Olympus, before Zeus conferred that office upon Ganymede; but she always retained the power of restoring the aged to the bloom of youth and beauty. According to Apollodorus, she became the mother of two sons by Hercules—Alexiares and Aniketos. In Homer she always appears as a virgin. In Athens altars were erected to her conjointly with Hercules. In Rome she was worshipped under the name of Juventas, and a temple in her honour existed on the Capitoline Hill at the time of Servius Tullius. Statues of Hebe are extremely rare; she is to be recognised only by the nectar-cup. All the world knows the masterpiece of Canova.

Heber, REGINALD, an English poet, and second Bishop of Calcutta, was born at Malpas, Cheshire, 21st April 1783. It was as a student of Brasenose College, Oxford, that he produced his prize poem *Palestine* (1803), the only prize poem perhaps which holds a place in English literature. In 1807 he was inducted into the family-living at Hodnet, in Shropshire. He was a frequent contributor to the *Quarterly Review*, his political views being those of a Tory and High Churchman, and in 1812 he published a volume of *Hymns*. He was appointed Bampton lecturer in 1815, a prebendary of St Asaph in 1817, and in 1822 was elected preacher of Lincoln's Inn. In the following January he accepted the see of Calcutta. The apostolic zeal with which he conducted his episcopacy was suddenly terminated by his death, of apoplexy, at Trichinopoly, on 3d April 1826. He was a voluminous writer, and published sermons, *A Journey through India*, &c., and he edited Jeremy Taylor's *Works* (1822). As a poet, his fame rests upon *Palestine* and his *Hymns* (new ed. 1878), which include such well-known favourites as 'Lord of Mercy and of Might,' 'From Greenland's Icy Mountains,' 'Holy, Holy, Holy, Lord God Almighty!' 'The Son of God goes forth to War,' &c. See Lives by his widow (1830) and G. Smith (1895). RICHARD HEBER, his half-brother, was born in Westminster in 1774, and died in 1833. He was a famous bibliomaniac. Dibdin estimated his collection in England at 105,000 vols., in addition to which he possessed many thousands of books on the Continent, the whole having cost him £150,000.

Hébert, JACQUES RENÉ, commonly known as *Père Duchesne*, one of the most despicable characters of the French Revolution, was born at Alençon, in 1755. At an early age he went to Paris as a servant, but was dismissed from more than one situation for embezzling money. Soon after the commencement of the Revolution he became one of the most prominent members of the extreme Jacobins; and when this group established *Le Père Duchesne* newspaper, for the purpose of crushing the constitutional paper edited by Lemaire and bearing the same title, Hébert was made editor of it. And he conducted his paper with such reckless ribaldry as to make himself a darling of the mob. In consequence of the events of the 10th August he became a member of the revolutionary council, and played a conspicuous part in the massacres of September. He was one of the commission appointed to examine Marie Antoinette, and his name will survive in unending infamy for one foul and baseless charge he brought against her. He and his associates, called Hébertists or *Enragés*, were mainly instrumental in converting the church of Notre Dame into a temple of Reason. But he went too fast for Robespierre, who got rid of him through the guillotine, 24th March 1794. His whining cowardice on the scaffold earned him the jeers and insults of the fickle mob.

Hebrew Language. The word Hebrew (*'ibrî*) is an adjective, formed, according to the Old Testament, from Heber (*'ébher*), a descendant of Shem (Gen. x. 22 24), who was the ancestor of Abraham (Gen. xi. 12-26). The Septuagint, however, already renders Gen. xiv. 13, 'Abraham the crosser' (i.e. of 'the river,' though Origen explains the name from 'crossing' Mesopotamia towards Canaan), and Aquila translates 'the dweller on the other side,' probably of the Euphrates, though it might be the Jordan. The word 'Hebrew' is used both of individuals and the people when antithesis to other nationalities is expressed (Jon. i. 9; Phil. iii. 5; Gen. xxxix. 14; xl. 15; Exod. i. 16; ii. 6, &c.), 'Israel' being more a domestic name, often having religious significance. As a national name, Israel belonged specially to the northern kingdom, of which it is used freely in the Moabite Inscription (e.g. lines 5, 11, 14).

The phrase 'Hebrew language' does not occur in the Old Testament. In the earliest reference to the speech (Isa. xix. 18) it is called the 'language of Canaan,' and in another passage, referring to events of the same period, 'Judean' or Jewish (2 Kings, xviii. 26, 28; Isa. xxxvi. 11, 13; cf. Neh. xiii. 24). This passage is interesting as showing the linguistic attainments of the Assyrian officials and others of this age. The Rabshakeh could speak Hebrew, and Hezekiah's officers understood Aramaic, which appears to have been the language of diplomacy and commerce at this time, a position to which it would naturally attain, from the fact that the Aramean peoples lay along the great trade routes between east and west. The name 'Hebrew' is first used of the language of the Old Testament in the prologue to Ecclesiasticus (c. 130 B.C.), and then in the New Testament (Rev. ix. 11). After the dissolution of the Jewish state Aramaic more and more made encroachment in Palestine, Dan. ii. 4–vii. 28, Ezra, iv. 8–vi. 18, and Jer. x. 11 being written in that dialect, to which also belong the words *Jegar-Sahadutha*, 'heap of witness' (Gen. xxxi. 47). Gradually it superseded Hebrew as the spoken language, and, though mixed with elements of Hebrew, was the dialect in use in the time of our Lord, as it had been for a long time previously. All the words reported as spoken by him (such as *talitha koumi* or *koum*, *lemâ shebaktâni*) are Aramaic. The name Hebrew was thus given to two languages, the ancient Hebrew, and the more modern Aramaic in actual use, though chiefly to the latter (John v. 2): 'their proper tongue,' to which Akeldama belongs (Acts, i. 19), is Aramaic. Which of the two languages is meant, Acts, xxi. 40, xxii. 2, xxvi. 14, may be doubtful.

The Hebrew language is one of the family of speeches since Eichhorn's time usually called Shemitic or Semitic, the peoples speaking them being in the main descendants of Shem. The family has four great divisions: (1) the Northern or Aramaic (Syriac or Eastern, and so-called Chaldee or Western Aramaic and Samaritan); (2) Middle or Hebrew (including Phœnician and Moabite); (3) Southern or Arabic (embracing Sabean or South Arabic, and Ethiopic); (4) To these must now be added an Eastern or Assyro-Babylonian division (see SEMITIC LANGUAGES). Hebrew shares with its sister-languages these and other peculiarities: roots with three consonants; vowels having no significance as stem-letters; two verbal forms for the expression of tense; two genders; the attachment of the oblique cases of personal pronouns to nouns and verbs in the form of suffixes; an inability, except in proper names, to form compounds, whether verbal or nominal; and a syntax distinguished by simple co-ordination of clauses by means of *and*, where other languages subordinate with a multiplicity of conjunctions. At a remote period we must suppose primitive Semitic spoken by a united, homogeneous people, which afterwards separated in various directions, each section retaining and developing some of the originally common elements of the tongue, until gradually, under many influences of climate and conditions of life, the great dialects acquired distinctness from one another. In this way some primitive elements would be retained by one family and others by another, while each would move along new lines of development, due to its idiosyncracies and circumstances, as Hebrew, for example, expresses 'west' by 'sea.' Even in the earliest form in which we observe Hebrew it shows marks of linguistic decadence. It has almost entirely renounced nominal case-endings; given up the use of the dual, except in a few nouns; is in process of substituting the reflexive for the passive (a process completed in Aramaic and Ethiopic); and has lost the consciousness of the strict sense of its elementary moods. In short, literary Hebrew is already nearly at the same level as vulgar Arabic, as distinguished from inflected Arabic, or as modern English is compared with Anglo-Saxon. On the other hand it has some peculiar excellences, as the greater freedom in regard to the place of words in the sentence, and the singular tense usage known as *vav conversive*, of which, however, it is now known to have no monopoly, but to share it with the language of Moab.

Beyond differences of pronunciation and usages peculiar to separate localities, 'dialects' can hardly have existed in Hebrew. In the north a shorter form of the relative appears, *she* or *sha* (Ass. *sha*)—e.g. Judges, v. 7. This is common in the Canticles (of disputed date), and in later books, as Ecclesiastes, and usual in post-biblical Hebrew. The Ephraimites appear to have shared the usual Shemitic tendency to confuse *sh* and *s* (Judges, xii. 6); and in the south Amos (vi. 8; viii. 8) shows another common failing, that of confusing the gutturals, a thing said to have gone to an extreme in Galilee in the age of Christ, and abundantly exemplified in Assyrian. So far as the literature of the language is concerned, only two periods can be distinguished: (1) from the earliest times to the restoration from exile (538), and (2) from the restoration to our era (see BIBLE). It is true that writers on the borders of the exile, such as Jeremiah and Ezekiel, show a tendency to employ Aramaic words and forms; but, on the other hand, writings of the exile period, as Isa. xl.–lxvi. and much else, are splendid examples of Hebrew composition. The restored community in Judah would of course still speak and write Hebrew. In the north of the country, however, the policy of Assyria had long ago settled a number of colonists, speaking mainly Aramaic. When Palestine came under the influence of the Syro-Greek kingdom the Aramaic pressure would become greater. And thus gradually Hebrew receded before the Aramaic, until by the time of the Maccabees, or considerably earlier, the latter had become the spoken language. Among the learned, however, the ancient tongue was still cultivated and written, though naturally not in its ancient purity, nor without many new developments. These new elements are of several kinds: first, nominal and verbal forms, partly absolutely novel, but mostly a great extension of forms occurring rarely in the classical language; and secondly, a considerably altered vocabulary, drawn partly perhaps from a lower stratum of popular speech than that touched by the biblical writers, but greatly from the Aramaic. Examples of this new literary, though degenerate, Hebrew may be seen in its earliest form in Ecclesiastes,

and in a much more advanced condition in the Mishna (c. 200 A.D.).

The character in which Hebrew was written was the ancient Semitic alphabet, common over much of the East, the origin of which is traced by some to Egyptian hieroglyphs, and by others to different sources (see ALPHABET). The oldest and most beautiful example of this character is the Moabite Inscription (c. 900 B.C.; see MOAB); a somewhat ruder form appears in the inscription from the Siloam tunnel, probably of the age of Ahaz or Hezekiah (740–700 B.C.; found in 1880; see *Proc. Soc. Bib. Archæol.* 1882). The latter was executed at their own hand by the workmen who cut the tunnel, and is naturally less artistic, though extremely interesting, as showing how extended the art of writing was at so early a time (Isa. x. 19). In the Moabite monument the same letter appears in several forms, which suggests either great practice on the part of the sculptor, or else that he faithfully copied a model supplied him by the pen, in this case a facile one. The character appears in a bigger, more robust form in the Phœnician inscriptions—e.g. of Eshmunazar. Somewhat modified it is Samaritan; in south Arabia it is Himyaritic or Sabean; and from there it passed to Abyssinia, and is Ethiopic. The Syriac and Arabic are the same letter in cursive forms. The Aramean influence on southern Palestine introduced not only its dialect but also its script. The present Hebrew square character is in a somewhat ornamental shape—a cursive form of the ancient alphabet adopted by the Arameans; the article ALPHABET shows both the Phœnician and the later square Hebrew character. The monuments show this Aramean cursive in various forms of development. Jewish tradition ascribes its introduction to Ezra, a tradition which expresses merely the facts that a change took place in the letter employed, and that this change was posterior to the return from exile. The use of the letter no doubt crept in gradually, just as the use of the Aramaic dialect did. The ancient letter is still seen on coins of the later Maccabean princes. Some deviations of the Septuagint from our present Hebrew text seem explainable from the supposition that their MSS. were written in the ancient character; while, on the other hand, some discrepancies rather suggest MSS. in the square letter. The words of Christ, 'one jot or tittle,' have been thought to show that the square character, in which *y* (י or *yod*) is much the smallest letter of the alphabet, had long been in use.

The history of the language would not be complete without one or two additional facts. (1) In Semitic languages the consonants alone are usually written. Of course, no language could be spoken, and no writing read without vowel-sounds, but no signs for these sounds existed. Certain weak consonants, however—viz. *h*, *w*, *y*, were early used to indicate the place of long vowels, particularly at the end of words, and also of diphthongal sounds (*ai* = *ê*, *au* = *ô*) in the middle of words. Already in the Moabite stone final vowels are so marked, and occasionally diphthongs within words. Phœnician, on the contrary, uses such signs very little. Ancient Hebrew agreed with Moabite in its practice, as appears from the Siloam inscription. The use of these so-called vowel-letters was probably scanty and fluctuating in early times, but became more regular afterwards. Unfortunately, we have no guarantee that transcribers were careful to preserve the antique spelling. Our present text is too uniform to be supposed to have preserved the varieties of different ages, and it is evident that the MSS. of the Septuagint translators in a multitude of cases were without the medial vowels, and in some cases without the final vowels, now present in the Hebrew text. In the end of the 1st or early in the 2d century a standard text was adopted, and modernising of the spelling in the main ceased. Peculiarities were henceforth registered, not effaced. This period during which the consonantal text was treated extends to the era of the Talmud (c. 500 A.D.). During its course a multitude of works were produced—e.g. *Midrashim*, or homiletical expositions, especially of the books of the Pentateuch; the Mishna (200 A.D.), a code of traditional law; and the tracts composing the Talmud, which are commentaries on the Mishnic law, but containing much haggadic or edifying matter. (2) Neither Jerome (d. 420) nor the Talmud knows anything but the consonantal text. The example of Syrian scholars and necessity led, however, to the invention of a very complete system of external signs for the vowel-sounds of the language. This is the Massoretic system of points, now printed in our Bibles. Its authors are unknown, and also the age at which it was completed. Minute as it is, it can make little pretension to represent the pronunciation of the ancient living language. The pronunciation of a language during a period of nearly a thousand years in disuse must have undergone changes; the Septuagint pronounces in many cases differently from the present text; and, in point of fact, the vocalisation represents not the pronunciation of a spoken language, but that of the solemn intoned reading in the service of the synagogue.

About the 10th century a new impulse was given to the study of Hebrew by the example of the Arabic grammarians. The interest of the latter was to begin with a purely religious one—i.e. to explain the Koran. Even the earliest collections of poetry had this religious object. The poetry of the desert was accepted as the purest Arabic, and it was collected and studied with the view of illustrating the syntax of the Koran. By-and-by grammar came to be cultivated for its own sake, and the ancient poetry studied for the sake of its intrinsic charms. In emulation of their Arabic confrères, a school of Hebrew grammarians arose, to which belong such names as Saadia of the Fayyum, Chayyuj (1000), Abu'l-Walid Merwan ibn Janach, Abenezra (d. 1167), Dav. Kimchi (d. 1235). Where Arabic was not used a neo-Hebraic language was employed by these scholars, greatly a return to biblical Hebrew, and in this many commentaries were composed, as by Abenezra, Kimchi, and Rashi of Troyes (d. 1105). At the revival of letters Christian scholars became apt pupils of the Jews—e.g. John Reuchlin (d. 1522). In the next century the chief seat of Hebrew learning was Switzerland, where flourished Buxtorf the Elder (d. 1629); and in the century following Holland, the most famous representative of the Dutch school being Alb. Schultens. In the 19th century the most distinguished promoters of Hebrew learning have been Gesenius of Halle and Ewald of Göttingen.

The following is Gen. i. 1–3 in Hebrew:

בְּרֵאשִׁית בָּרָא אֱלֹהִים אֵת הַשָּׁמַיִם וְאֵת הָאָרֶץ׃
וְהָאָרֶץ הָיְתָה תֹהוּ וָבֹהוּ וְחֹשֶׁךְ עַל־פְּנֵי תְהוֹם וְרוּחַ
אֱלֹהִים מְרַחֶפֶת עַל־פְּנֵי הַמָּיִם׃ וַיֹּאמֶר אֱלֹהִים יְהִי־אוֹר
וַיְהִי־אוֹר׃

See Gesenius, *Gesch. der Heb. Sprache* (1815); Renan, *Hist. Gén. des Langues Sémitiques* (4th ed. 1863).

MODERN HEBREW.—A few observations may be added, in conclusion, on the use of Hebrew as a spoken and written language among modern Jews. Hebrew has continued down to the present day as the language of the synagogue. Except in the Reform communities of Germany and America, public and even private worship is

almost entirely conducted in 'the sacred tongue.' Although the majority of western Jews, particularly among the upper and middle classes, possess but an imperfect acquaintance with it, the authorities manifest a strong disinclination to cease praying in a language which, it is urged, constitutes a powerful link between Israel's present and past, and serves as a bond of union between Jews all the world over. Outside the synagogue, Hebrew can scarcely be said to have survived as a *spoken* language, except that in Jerusalem and other eastern cities it forms a sort of *Lingua Franca* among the Jews of various nationalities settled there. As a *written* and *printed* language, however, the employment of Hebrew is far more general. It serves as a universal medium of correspondence, both private and official, among Jews in various parts of the world, and particularly between the East and the West. Various weekly journals are also written in it, in Europe as well as in Palestine. Added to this, numerous Hebrew works on all subjects continue to be composed by learned Jews. The Hebrew thus used for modern purposes is usually not the pure Hebrew of the Bible and synagogue, but the rabbinical dialect in which Jewish doctors of the law have studied and commented, written and disputed since the age of the Mishna, and which has been developed and amplified by Jewish philosophers, poets, and grammarians throughout the middle ages. Both kinds of Hebrew—biblical and rabbinical—must be carefully distinguished from the *patois* dialects affected by Jews in countries where they have not yet been fully emancipated or modernised. In Russia and the adjacent parts of Germany and Austria they speak a jargon composed of Hebrew and corrupt German, called *Jüdisch-Deutsch*, while in parts of the East a Judæo-Spanish dialect flourishes by its side. The pronunciation of Hebrew differs among the two geographical sections into which Jews are divided, and which are known as *Ashkenazim* or 'Germans,' and *Sephardim* or 'Portuguese,' the former being of German and Polish origin, and the latter having migrated from the south of Europe or being still distributed there. The origin of this difference is not exactly known, but it may be assumed that the 'Portuguese' mode of reading originally came from Palestine, where the vocalisation and pronunciation of Hebrew were fixed by the Massorites of Tiberias, and that the German Hebrew originated in the academies of Babylon under the influence of the Eastern-Syrian grammarians. The Sephardic system is hence supposed to be purer than the Ashkenazic.

Hebrews. EPISTLE TO THE. The title of the epistle in the earliest MSS. is simply 'To Hebrews.' This title is probably not from the hand of the writer, but due to some copyist who embodied the writing among others. The term 'Hebrews' is a national title given to all those descended from Abraham, in opposition to Gentiles or Greeks (2 Cor. xi. 22; Phil. iii. 5; cf. Heb. ii. 16); or in a narrower sense it is applied to Jews still speaking a Semitic language, in opposition to Hellenists or Greek-speaking Jews (Acts, vi. 1). It is probably used in the more general sense here, and the title merely suggests, what is evident, that the epistle was addressed to persons of Jewish descent. The opinion that the letter was addressed to Hebrews in general, wherever they might be, cannot well be maintained, owing to the many local and personal references, and the details of history given by the author. He hoped to see the Hebrews soon, as he had been with them before (xiii. 19, 23). In their earlier history they had suffered persecution and the spoiling of their goods (x. 32), some of them had been or were in bonds (xiii. 3, x. 34), although their afflictions had not yet gone so far as martyrdom (xii. 4), unless it may be that some of those having the rule over them had so suffered (xiii. 7). Their circumstances and the lapse of time, and probably also the disappointment of their hopes of the coming again of Christ (x. 37), had not been without a wearing effect upon them; their Christian enthusiasm had grown cold (x. 25), and they had not advanced, or rather had fallen back, in their Christian knowledge and experience (v. 11–14); and though distinguished by liberality to their poorer brethren, as they had always been (vi. 10), they were wavering in their faith, and in danger of falling away from it (ii. 1–3, iii. 12, vi. 4, x. 25–29); they had need of patient endurance (x. 36, xii. 1 *et seq.*) and fear lest any of them should seem to come short of the rest of God (iv. 1, xii. 15). Terrible warnings are uttered by the author in regard to the sin of apostasy and the impossibility of recovering to the faith those who fall away after being enlightened (vi. 4–8, x. 26–31, xii. 15–17), although that for which they were in danger of renouncing their Christian faith is nowhere distinctly stated. From the general drift of the epistle, however, it may be inferred that what the author feared was a relapse into Judaism, and hence he exhorts them to break conclusively with the old dispensation and go forth without the camp (xiii. 9–14).

The question of the locality where persons having such a history and living in such circumstances must be sought has been very differently answered. The traditional view has been, under the assumption of the Pauline authorship of the epistle, that the church in Jerusalem was addressed. And perhaps this is still the prevailing opinion. There are, however, serious obstacles in the way of this opinion. The church in Jerusalem must have still contained many who had seen and heard the Lord, while those here addressed had only been evangelised by those who heard him (ii. 3). Such facts as these: that the epistle is in Greek, and by a writer who knows the Scriptures only in Greek, and who, though hardly a native of Palestine, stands in such relations to the Hebrews as he does; that they are interested in Timothy, the devoted minister of St Paul (xiii. 23); that the church, so far from being poor, is able to minister to the necessities of the saints (vi. 10); and that the author seems to count upon the sympathy of his readers with his advanced views—these facts are rather against Jerusalem. On the other hand, the idea that the Hebrews must have been exposed to the seductions of an imposing ritual, which could only be the Temple service, has little support in the epistle. The author's references to the Old Testament ritual are purely theoretical, and have no bearing on the existing practices; he reasons entirely on the written scripture, on Judaism as founded by Moses, and his arguments would be understood by Jews everywhere, as the system of thought and the feelings against which he directs them were common to them in all places. Others have thought of Alexandria. The author is certainly a man of Alexandrian culture, and the line of thought he pursues would be very natural if addressed to Alexandrian Jews. It is almost a fatal objection to this view, however, that, though the epistle was early known and highly valued in the church of Alexandria, not a trace of a tradition appears that they were the recipients of it. Clement believed that the epistle was written in Hebrew, and addressed to Jerusalem by St Paul. In modern times some have advocated the claims of Rome. The first references to the epistle are found in the letter of the Roman Clement to the Corinthians (*c.* 96 A.D.). The consistent tradition in Rome, too, is that the epistle is not by St Paul; and the reference to Timothy, and to those of Italy (xiii. 24) would, on this view, find a natural explanation, and also, perhaps, some remarkable coincidences between the epistle and that

to the Romans. The Church of Rome, however, must have always been greatly Gentile, and references like xiii. 7, 17 preclude the idea that a Jewish section of a church was addressed.

The authorship of the epistle is involved in equal obscurity. In the earliest times opinion was divided. In Rome and the West the consistent tradition is that the epistle is not Pauline. In Africa Tertullian refers to it as by Barnabas (*De Pudic.*, c. 20). In Alexandria and the East, on the other hand, it is regarded as Pauline, either immediately, or mediately through a translator (Clement), or some one who had given the Pauline thoughts form and expression (Origen). Augustine gave in to the Alexandrian view, and since his time the Pauline authorship was accepted in the West. At the Reformation Luther suggested Apollos as the author; and Calvin either Luke or Clement of Rome. Modern scholarship is virtually unanimous in the opinion that the epistle is not from the hand of St Paul. This view is based on many things, as upon the language, which is purer Greek than any other New Testament writing; upon the rhetorical, rhythmical, and flowing style, and the carefully planned and systematic form of the treatise, which has none of the abruptness and sudden transitions characteristic of the Pauline writings; upon the fact that the author appears to be ignorant of Hebrew, quoting always the Septuagint, and basing his reasoning on its renderings, even when it deviates from the Hebrew; upon the different formulas employed in citing Scripture; and particularly upon the author's system of thought, which reflects Alexandrian Jewish philosophy in some places, and which, though reaching the same conclusion with St Paul that Christianity has fulfilled and superseded the old economy, reaches it by a different road. The place of St Paul's circle of legal ideas—guilt, satisfaction, imputation, justification by faith—is taken by a circle of ideas having reference to worship of God: sin is uncleanness hindering the sinner from drawing nigh to God; the blood of Christ purifies the conscience so as to serve the living God (ix. 14); hence redemption is conceived as the work of a perfect High-priest. Faith is generalised into a realising of the unseen (chap. xi.); and the Spirit does not appear to occupy the place he has in the Pauline writings as the source of the new Christian life. Modern scholarship has not succeeded in suggesting any new name as author of the epistle, opinions being divided in favour of Apollos, Barnabas, Clement, Luke, and Silas.

It has been thought that if Jerusalem had fallen before the author wrote he would certainly have used this fact to support his teaching that Judaism had been transfigured into Christianity, and consequently that the epistle dates before 70 A.D., probably about the beginning of the Jewish war (67 A.D.). It must be acknowledged that owing to the author's theoretical method of reasoning on Judaism, which would apply to it whether the temple and ritual remained or not, this argument is not very strong, and others prefer a later date. The epistle is largely used in Clement's Epistle, which is usually assigned to about 96 A.D.

The persons to whom the epistle is addressed being such as above described, its theme is, the finality of Christianity as a religion. This finality is shown by a continuous contrast with Judaism. The contrast has three main steps, which move, so to speak, backwards or inwards, accompanied always by earnest exhortation. (1) Chap. i.–ii., Christ, the Son, exalted because of death to be head of the new world of redemption. Contrast with angels. (2) Chap. iii.–iv. 13, Christ, the Son, the faithful leader into the rest of God. Contrast with Moses and Joshua. (3) Chap. iv. 14–x. 18, Jesus, the Son of God, the heavenly High-priest, and true sacrifice. Contrast with Aaron, with the earthly tabernacle, and with the sacrifices of bulls and goats. On this follows a splendid passage of exhortation (chap. x. 19–xii. 29) on the application and personal appropriation of the truths just taught. And finally (chap. xiii.), a more personal conclusion.

See the commentaries by Bleek (3 vols., 1828–40), the same, Commentary (1 vol. 1868); Tholnck (3d ed. 1850); Delitzsch (1857, trans. Clark); M. Stuart (new ed. 1876); Bisenthal (1878); Angus (1883); Lowe (N.Y. 1884); A. B. Davidson, (Clark, Handbooks); Kay (1885); Lunemann (in Meyer, Eng. trans.); Weiss (in Meyer, 1888); Rendall (1888); Edwards (1888, Expositor's Bible); Westcott (1889); Lange (Eng trans., also Riehm, *Lehrbegriff des Hebräerbriefs* (1859). Full literature in Lange's Commentary (Clark).

Hebrews, Gospel of the. See Apocrypha.

Hebrides, or Western Islands, the name applied in a general sense to all the islands on the west coast of Scotland. To the Outer Hebrides, the geological substratum of which is almost exclusively gneiss, belong Lewis with Harris (Long Island), North Uist, Benbecula, South Uist, Barra, and the remote group of St Kilda, 60 miles to the west. The principal of the Inner Islands, composed chiefly of trap and slate, are Skye, Eigg, Coll, Tiree, Mull, Iona, Staffa, Ulva, Lismore, Kerrera, Colonsay, Oronsay, Jura, and Islay. Bute, the Cumbraes, and Arran, are usually counted amongst the Hebrides; and to the same group were anciently assigned the peninsula of Kintyre, the island of Rathlin, and the Isle of Man. The total number of islands of any size is about 500, but of these only one-fifth are inhabited. The population was 100,021 in 1881. Of the whole surface only about 200,000 acres are arable; the rest is pasture-land of little value, morasses, peat-mosses, lakes, and barren sands and rocks. Owing to the influence of the Gulf Stream, the Hebrides have a mild though humid climate. Politically the Hebridean isles are distributed among the Scottish counties of Ross, Inverness, Argyll, and Bute. The humbler class of natives for the most part speak Gaelic. The people are much occupied in fishing and fowling (see Crofters). A large proportion of the area has been converted into sheep-walks, whilst extensive tracts are let to sportsmen.

The Hebrides are the *Ebŭdæ* of Ptolemy and Pliny's *Hebŭdes* (of which 'Hebrides' is a corruption, due originally to a misprint), and *Sudreyjar* (Southern Islands) of the Norwegians. This last name was Latinised as Sodorenses, which survives in the title 'Bishop of Sodor and Man.' The early Celtic inhabitants were converted to Christianity by St Columba in the 6th century. Some three centuries later several of the islands were colonised by Norwegians, who came hither to escape the iron rule of Harold Haarfager (q.v.). But in consequence of the severe depredations which these sea-rovers afterwards committed on the coast of Norway, Harold sent an expedition westwards, which subdued all the Western Islands as far south as Man. To Norway they remained subject till 1266, when they were transferred to Scotland. From that time the islands were governed by native chiefs, until in 1346 the head of the Macdonalds reduced the whole under his authority, and took the title of Lord of the Isles (q.v.). But from the beginning of the 16th century they were gradually annexed to the Scottish crown. In the 19th century the Hebrides have become widely known through Scott's poem *The Lord of the Isles* and Mr William Black's charming novels.

The more important works on the Hebrides are Martin's *Description* (1703); Pennant's *Tour* (1774); Dr

Johnson's *Journey* (1775); Gregory's *History* (1836); Macculloch's *Description* (1819); Buchanan's *Hebrid Isles* (1883); and Gordon-Cumming's *In the Hebrides* (1883).

Hebrides, New. See New Hebrides.

Hebron, one of the oldest cities in Palestine, belonging to the tribe of Judah, 21 miles SSW. of Jerusalem. It was anciently called Kirjatharba, and at a later period was the seven years' residence of King David before he conquered Jerusalem. The modern town, El Khalîl ('the friend'—of God, Abraham), is a poor place, inhabited by some 10,000 people. It lies low down in a narrow and picturesque valley—the Valley of Eshcol, famous now, as of old, for its thick clustering grapes, its olives, and other fruits. The church erected by the Empress Helena, the mother of Constantine, on the spot where Abraham is said to have been buried, has been converted into a mosque called *El-Haram* ('sanctuary'), built to enclose the cave which is the traditional burial-place of Abraham, Isaac, and Jacob and their wives. See an article by Conder in the *Palestine Exploration Quarterly*, October 1882.

Hecatæus of Miletus, an early Greek historian and geographer, usually styled 'the logographer,' flourished most probably about 500 B.C. He seems to have visited Greece, Thrace, the countries bordering on the Euxine, and many of the provinces of the Persian empire, with parts of Italy, Spain, and Africa, and the results of his observations were given in two great works—his *Tour of the World*, and his *Histories* or *Genealogies;* the latter, however, is little more than a prose version of the poetical legends of the Greeks. Only fragments now remain, which have been edited by Creuzer, Klausen, and Müller. At the revolt of the Ionians against Persia he dissuaded its ringleader, Aristagoras, from an attempt so far above the means of his countrymen; and when that counsel was despised, urged the formation of a fleet, but in vain. Hecatæus afterwards went as ambassador to the Persian satrap Artaphernes, and induced him to treat the Ionians with leniency.

Hec'atē, a mysterious goddess who was apparently unknown to the Greeks of Homeric times and may be of oriental origin. She makes her first appearance in Hesiod as a goddess having power over earth, heaven, and sea. This triple power may perhaps give the clue to the fact that in art she is occasionally represented as a triple figure. It also explains the fact that ultimately, and especially in Orphic literature, she came to be identified with many other goddesses, such as Artemis, Eileithyia, Selene, Iris, Persephone, Aphrodite, Gaia, Hestia, Isis, Physis, and the Bona Dea. Owing to the extent of her domain she was especially able to grant the wishes of her votaries and to give them the fulfilment of their desire in battle, in athletic and other contests, in the popular assembly, and in the law-courts. But her power was above all displayed in the matter of ghosts and bogeys; she was able not only to ward off the visits of such hags but also to send them. Indeed, besides sending an Empusa or an Antæa, she also herself appeared as a bogey, with torch and sword, and snakes for hair; or she might appear as a dog, a mare, a lioness, or a cow. As her appearance was the sign for dogs to bark, so she was supposed to be accompanied by a train of Stygian dogs. The origin of this figure is uncertain; she is claimed as a moon goddess, and her name is interpreted in accordance with this view as indicating the action of light at a distance. It makes against this theory, however, that the lunar functions of Hecate are not mentioned by any author earlier than Sophocles, and that they do not become prominent in her worship until post-classical times, and then only 'in the systems of the later mythologists' (see *Class. Rev.* June 1888). Her intimate connection with the spirits of the dead would rather point to her having originally been a goddess of the nether world, for the earth is regarded as the abode of the spirits of the departed. This would explain her connection with the mysteries, and the propitiatory offerings made to her in atonement for sin. Finally, the unsatisfactory explanation of her name just given may be safely set aside, as too abstract, in favour of the interpretation of the name as meaning 'dog' (Hecate : Ger. *hund* : Eng. *hound* : : Gr. *hekaton* : *Hund*-red. See *Class. Rev.* Nov. 1889). This harmonises with various points in the ritual of Hecate; dogs were offered to her at cross-ways (which are favourite haunts for ghosts), she herself is termed fond of dogs, and sometimes appeared leading Cerberus.

Hecatomb, in the worship of the Greeks, and in other ancient religions, a sacrifice of a large number of victims, properly, although by no means necessarily, one hundred. As early as the time of Homer it was usual only to burn the legs wrapped up in the fat and certain parts of the intestines, the rest of the victim being eaten at the festive meal after the sacrifice. In Athens the hecatomb was a most popular form of sacrifice; while the thrifty Spartans on the contrary limited the number both of the victims and of the sacrifices. In the hecatomb, strictly so called, the sacrifice was supposed to consist of one hundred bulls; but other animals were frequently substituted.

Hecker, Friedrich Karl Franz, a leader of the democratic party in the German revolution of 1848, was born at Eichtersheim, Baden, September 28, 1811. After studying law in Heidelberg, he became in 1838 advocate of the supreme court in Mannheim. But in 1842 he abandoned his profession for political life, joining the democratic and socialistic party, of which he speedily became one of the recognised heads. On the outbreak of the revolution in 1848 he endeavoured to convert the preliminary convention (*Das Vorparlament*) into a permanent republican assembly. But, frustrated in this attempt, he put himself at the head of a band of revolutionists, and invaded Baden from the south; he was, however, defeated at Kandern (20th April), and fled to Switzerland. In the following year he settled in America as a farmer near Belleville, in Illinois. On the outbreak of the civil war he raised a regiment of Germans, and afterwards for a time commanded a brigade. He died at St Louis, 24th March 1881.

Hecker, Justus Friedrich Karl, medical author, was born 5th January 1795, and became professor of Medicine at Berlin. He died 11th May 1850. Among his writings are a history of medicine (1829), books on the Black Death, &c., and the great work, the *Epidemics of the Middle Ages* (trans. for Sydenham Society, 1846).

Heckles (Mid. Eng. *hekele*, from the Dutch *hekel*, *haak*, 'a hook;' cf. Ger. *haken;* another English form is *hackle*) are very important parts of various machines employed in the preparation of animal and vegetable fibres for spinning. They consist of a series of long metallic teeth, through which the material is drawn, so that the fibres may be combed out straight and so fitted for the subsequent operations. Gills are heckles with finer teeth (see Spinning).—*Heckling* is also now the received term (first used in Scotland) for the rough and trying process of catechisation to which parliamentary candidates and members are subjected by their constituencies.

Heckmondwike, a market-town in the West Riding of Yorkshire, 8 miles NE. of Huddersfield.

It is the chief seat of the carpet and blanket manufactures in the West Riding, and also makes rugs, pilot-cloth, and fustians. There are ironworks, machine shops, and coal mines in the neighbourhood. Here was born John Curwen, the inventor of the Tonic Sol-fa system. Pop. (1851) 4540; (1891) 9709.

Hecla, or HEKLA, a volcanic mountain in Iceland, stands isolated about 20 miles from the south-west coast and 68 miles E. from Reykjavik. Its snow-clad summit is 5102 feet high, and has five craters. The sides of the mountain are seamed by numerous deep ravines. The principal rocks are lava and tuff. 'Fantastic groups of hills, craters, and lava, leading the eye to distant snow-covered jokuls; the mist rising from a waterfall; lakes embosomed amid bare bleak mountains; an awful and profound slumber; lowering clouds; marks all around of the furious action of the most destructive of the elements, give to the region a character of desolation scarcely to be paralleled.' A record of the eruptions has been kept since the 9th century, during which time there have been eighteen outbreaks. These have generally been very violent, and have often continued for a considerable time. In September 1845 a terrific outbreak occurred and lasted for more than a year. A fine dust from this eruption was scattered over the Orkney Islands, a distance of 500 miles from Hecla. Indeed, the great quantities of fine dust ejected, and the immense distances to which it has been carried, have generally been noted as characteristic of the Icelandic eruptions.

Hectare. See ARE.

Hectic Fever (Gr. *hektikos*, 'habitual;' see FEVER) is the name given to the fever which occurs in connection with certain wasting diseases of long duration. It is one of the most serious and constant symptoms of Consumption (q.v.), and seems to be directly related to the progressive emaciation which marks the course of that malady. In the morning the patient's temperature may be normal. He may even feel chilly. But towards evening or after eating he grows hot and flushed; and there is a preternatural vividness of expression, which, with the heightened colour, sometimes gives a very fallacious impression of health. The patient retires to bed, has tossing and uneasy sleep, and wakens in the middle of the night, or towards early morning, bathed in cold perspiration, and in a state of extreme languor. The same exhausting cycle repeats itself day after day. The only radical way of treating the fever is to cure the disease on which it depends. When the symptom itself must be combated, a pill containing a grain of sulphate of quinine, with half a grain of digitalis and as much of Dover's powder, taken three times a day, is often serviceable.

Hector, the eldest son of King Priam and Hecuba, husband of Andromache, and father of Astyanax (Scamandrius), appears in Homer's *Iliad* as the ideal of a warlike hero, brave to the last degree, yet faithful and tender alike as husband, father, and son. One of the noblest passages in the *Iliad* describes his parting with Andromache. He holds the same rank among the Trojans as Achilles among the Greeks, and, after bearing the main burden of the war, falls at length by the hand of Achilles enraged at the death of his beloved companion Patroclus. His body was dragged in triumph by the conqueror round the tomb of Patroclus, but was afterwards ransomed by Priam, who caused it to be burned with great pomp.

Hecuba (Gr. *Hekabe*), the second wife of Priam, king of Troy. During the Trojan war she witnessed the destruction of all her sons, with the exception of Helenus, and at last saw her husband murdered before her eyes by the savage Pyrrhus. After the destruction of Troy she fell into the hands of the Greeks as a slave, and, according to one form of the legend, threw herself in despair into the sea. Euripides (in his tragedy of *Hecabe*) and other ancient tragedians describe her as a tender mother, a noble princess, and a virtuous wife, exposed by fate to the most cruel sufferings.

Heddles. See WEAVING.

Hedge (A.S. *hege*, another form of *haga*, whence modern *haw*; cf. Ger. *hag*. The Fr. *haie* is of Teutonic origin), a living or growing fence, in contradistinction to wall, paling, &c., used for the purposes of enclosure, shelter, and ornament in connection with agriculture, forestry, and gardening. Hedges are very much used in some parts of the world, whilst others, equally cultivated, are almost destitute of them. Thus, whilst they are very common in many parts of Britain, they are comparatively rare in France and Germany, as well as in America. They are formed of many kinds of trees and shrubs according to the purpose in view, the nature of the exposure, the elevation of the site, and the soil in which they are to be planted. It is essential, whatever plant may be used, that it should bear without injury the degree of annual pruning necessary to keep it trim and within the proper limits of a fence.

For the purposes of agriculture and forestry Hawthorn (q.v.) is almost universally employed in Britain wherever the conditions of soil and situation are favourable to its growth. When properly attended to, especially in respect of annual pruning, it is the most effectual fence for domestic animals, and also an excellent shelter. On elevated sites, those exceeding 1000 feet above sea-level, it does not succeed well. In such positions elder, mountain ash, &c. are planted for shelter in the form of hedges, but are deficient in the other qualities of a fence. Beech-hedges are familiar in some districts. Substitutes for hawthorn in providing shelter by the seaside are found in sea-buckthorn, snowberry, scarlet dogwood, sloe, wild-pear, &c., but none of them are of value in repelling cattle. Ornamental hedges are formed of holly, yew—the latter is regarded as poisonous when eaten by cattle, horses especially, and should therefore be selected only for positions which they cannot approach—arbor vitæ, laurel, privet, barberry, both evergreen and deciduous; beech, hornbeam, &c. In some parts of the west of Scotland and Wales, and in the south of England and many parts of the coast of Ireland, permanent hedges of fuchsia, arbutus, and other beautiful evergreen or flowering shrubs are to be found, though they will not endure the cold of inland and east coast districts in the same latitudes.

In the United States the English hawthorn is useless as a hedge-plant, as the foliage is late, is destroyed by the heat, and is much infested by insects; the native thorns are little better. In various parts of the states where hedges are employed serviceable plants are bodock (see BOIS D'ARC), honey locust, pyricanth, the Macartney rose, buckthorn, barberry, &c.

Hedges were in use among the ancient Romans, chiefly for the enclosure of vineyards and gardens. It is probable that they have existed in England since the times of the Romans, although not very common till the end of the 17th century; but they are supposed to have been first introduced into Scotland and Ireland by the officers of Cromwell's armies.

Hedgebote, an old word for the right of a tenant to cut wood on the farm or land for repairing the hedges or fences.

Hedgehog, the European representative of the genus Erinaceus, the type of the family Erinaceidæ, order Insectivora (q.v.). The chief characteristics of the genus are: body capable of being rolled up into a ball by the action of a powerful muscle arising from the head and neck on either side, and forming a loop around the posterior extremity; ears distinct; teeth, three incisors on each side in either jaw, the central pair long and prominent, molars, seven on each side above, five below, with rounded tubercles; zygomatic arch of the skull complete; legs short, with five toes on each foot; the two leg bones ankylosed; tail short; back covered with spines, the remainder of the body with hairs and bristles.

There are fourteen species, none of which occur in the New World or Australia. The Common Hedgehog (*Erinaceus europæus*) has a sharply pointed muzzle and ears less than half the length of the head. The eyes are small and black. The animal is at most about a foot long, and some six inches high. The spines which cover its back attain a maximum length of about an inch; they are sharply pointed and remarkably firm and elastic, so much so that they constitute a cushion upon which the animal will allow himself to fall from a considerable height with impunity. They are finely grooved along the sides, and have a pin head-like root so attached to the muscle of the back that when the latter contracts they radiate outwards in all directions.

Common Hedgehog (*Erinaceus europæus*).

The animal eats small vertebrates, such as mice, young birds, and frogs, insects, worms, and sometimes vegetable matters. It is very useful in a garden or in a house infested by cockroaches. It has even been known to attack and devour snakes, seeming to have some special power of resisting not only the poison of the viper, but also other noxious substances. It is nocturnal in its habits, and hibernates throughout the winter, and, according to the Gypsies, with whom it is a special delicacy, it does store up birds, mice, crab-apples, &c. It inhabits hollows of trees or crevices in the rocks, but in default of these will excavate itself a burrow. The pairing season is from the end of March to the beginning of June; and the period of gestation is seven weeks. Three to six (rarely eight) young are born at once; they have both the eyes and ears closed. The spines are at first quite white and soft, and since they point backwards and the young are born head first there is no risk of injury to the mother during parturition.

Its area of distribution extends over the whole of temperate Europe and the greater part of Asia north of the Himalayas. Fossil hedgehogs have been found in the Tertiary formations.

Hedgehog Plant, a name given to those species of medick (Medicago) which have the pods spirally twisted and rolled up into a ball beset with spines. They are particularly plentiful on sandy grounds near the sea in England, and in some parts of South America; and their pods are too plentiful in the South American wool imported into Britain. They afford excellent food for sheep and cattle.

Hedge-mustard (*Sisymbrium*), a genus of plants of the natural order Cruciferæ, annual or rarely perennial herbs, with very various foliage, small yellow or white flowers, and a long roundish or six-angled pod (silique). Several species are natives of Britain, of which one, the Common Hedge-mustard (*S. officinale*), was once employed in medicine for catarrhs and other ailments. It is an annual plant, plentiful in waste places and by waysides, sometimes two feet high, branched, with runcinate or deeply-lobed leaves, stem and leaves hairy.

Hedge-nettle. See STACHYS.

Hedge-sparrow (*Accentor modularis*) is really a small European Warbler (q.v.) resembling a sparrow in colouring.

Hedjaz. See ARABIA.

Hedjrah. See HEGIRA.

Hedley, WILLIAM (1779–1843), born at Newburn near Newcastle, the improver of Trevithick's locomotive. See RAILWAYS.

Hedonism. See ETHICS.

Heem, JAN DAVIDSZ VAN, the greatest Dutch painter of 'still life,' was born at Utrecht in 1606. In 1635 he enrolled himself in the Antwerp guild of painters; and in that city he died in 1683 or 1684. Heem's pictures represent for the most part fruits and flowers, insects and creeping things, and drinking cups, bottles, &c. Masterpieces by his hand are hung in the galleries of Amsterdam, Vienna, Berlin, Munich, St Petersburg, and other places. His drawing and colouring are exquisite, and his use of chiaroscuro unsurpassable.

Heeren, ARNOLD HERMANN LUDWIG, German historian, was born 25th October 1760, at Arbergen, near Bremen. He first made himself known by an edition of Menander's *De Encomiis* (1785), and in 1787 was appointed professor of Philosophy, and in 1801 professor of History, at Göttingen. He married in 1797 a daughter of Heyne, and died 7th March 1842. The striking feature about his teaching and writing was that he studied the peoples of classic antiquity from the modern standpoint, as the title of his principal work shows—*Ideen über Politik, den Verkehr und den Handel der vornehmsten Völker der alten Welt* (1793–96; 4th ed. 1824–26; Eng. trans. 1833). Besides this he wrote *Geschichte des Studiums der classischen Literatur seit dem Wiederaufleben der Wissenschaften* (2 vols. 1797–1802), *Geschichte der Staaten des Alterthums* (1799; 5th ed. 1828; Eng. trans. 1840), and *Geschichte des europäischen Staatensystems und seiner Colonien* (1800; 5th ed. 1830; Eng. trans. 1834), which abounded in new views and acute expositions. His *Untersuchungen über die Kreuzzüge* won a prize offered by the National Institute of France. His *Kleine historische Schriften* (3 vols. 1803–8) contain some very interesting treatises and a biography of Heyne. In 1821–26 he published an edition of all his historical works in 15 vols.

Hefele, KARL JOSEPH VON, an eminent Catholic church historian, was born at Unterkochen in Würtemberg, 15th March 1809. He studied at Tübingen, and became in 1836 *privat-docent*, and in 1840 professor of Church History and Christian Archæology, in the Catholic theological faculty of that university. He showed himself a dangerous enemy to the dogma of papal infallibility even after his consecration as Bishop of Rottenburg in 1869, by his weighty contributions to the Honorius controversy: *Honorius und das sechste allgemeine Concil* Tub. 1870), and *Causa Honorii papæ* (Naples, 1870). But after his return from Rome, in a pastoral epistle in 1871 he gave in his adhesion to the dogma, with the explanation that the infallibility of the pope, as well as that of the

church, referred only to doctrine given forth *ex cathedra*, and therein to the definitions proper only, but not to its proofs or applications. Of Hefele's writings may be named an edition of the Apostolic Fathers (1839; 4th ed. 1855); *Chrysostomus Postilla*, a translation (1845; 3d ed. 1857); *Die Einführung des Christenthums im südwest lichen Deutschland* (1837); *Der Kardinal Ximenes und die kirchlichen Zustände Spaniens im 15ten Jahrhundert* (1844; 2d ed. 1851; Eng. trans. by Canon Dalton, 1860); *Beiträge zur Kirchengeschichte, Archäologie und Liturgik* (1864-65); and especially his magistral *Konziliengeschichte* (Freiburg, 7 vols. 1855-74; 2d ed. 1873-79; the first part to the Council of Nice translated by Clark, 1871). He died 5th June 1893.

Hegel, GEORG WILHELM FRIEDRICH, was the last in a succession of four great writers, who during the later part of the 18th and the first quarter of the 19th century developed the idealistic philosophy of Germany; the other three being Kant, Fichte, and Schelling. He was born at Stuttgart on the 27th August 1770, and educated at the university of Tubingen, where he formed an intimate friendship with Schelling, his philosophical predecessor. Schelling was five years younger than Hegel, but very precocious. His rapid intuitive genius urged him to express his thoughts almost before they were ripe for expression, and he had begun to publish important contributions to philosophy even before his student-life had come to an end. Hegel, on the other hand, was slow in his intellectual development, and from a desire for systematic completeness and consistency he was unwilling to utter his thoughts till he had made all their relations clear to himself. Consequently he passed through the university without any special distinction, and it was not till six years after he left it—years during which he maintained himself by acting as a private tutor—that he began to seek academic work and to bring his views upon philosophical questions before the public.

In 1801, however, he entered upon his scholastic career at the university of Jena, publishing at the same time an essay on the difference between the philosophies of Fichte and Schelling, in which he on the whole placed himself on the side of the latter, though not without indicating some divergences of view. From 1801 to 1806 he continued to teach in the university of Jena, first as a *privat-docent* (or licensed lecturer), and then as a professor extra-ordinary, and in the early part of that period he joined with Schelling in writing a philosophical periodical called the *Critical Journal of Philosophy*. At this time the two philosophers were so closely identified in their views that there has been considerable dispute as to the authorship of some of the articles. In one of Hegel's latest contributions, however, the reasons for his subsequent separation from Schelling are clearly indicated. It was not till 1807 that Hegel published the *Phænomenology of the Spirit*, the first work in which he fully exhibited the depth and independence of his philosophic genius. By this time, mainly in consequence of Napoleon's victory over the Prussians, the university of Jena was for a time broken up, and Hegel was forced to find employment as the editor of a newspaper at Bamberg. In the following year he was appointed director of the gymnasium or public school of Nuremberg, where he remained during the next nine years. In 1811 he married, and in the following year he published the first volume of his greatest work, the *Logic*, a treatise which treats of what is ordinarily called Logic in connection with Metaphysic. It was not till 1816 that his growing fame as a writer secured his nomination to a professorship in Heidelberg; this, two years after, he exchanged for the chair of Philosophy at Berlin formerly occupied by Fichte. There he continued to teach till the 14th November 1831, when he was carried off by a sudden attack of cholera. During these years he published several works, of which the most important is the *Philosophy of Right*, and contributed several articles to the *Philosophical Year-book*, a journal which was mainly, though not exclusively, the organ of his disciples. His influence during this period was so great that he might also be said to have been the philosophical dictator of Germany. At his death a number of his friends combined to prepare a complete edition of his works, in which they included not only the books he had published during his lifetime, but also reports of courses of lectures delivered by him upon many departments of philosophy. Among these may be mentioned specially his lectures upon the *Philosophy of Religion*, the *Philosophy of Art*, the *History of Philosophy*, and the *Philosophy of History*.

It is impossible within our limits to characterise adequately the work of such an encyclopædic mind as Hegel's, but it is possible in a few words to indicate the main tendencies of his philosophy. In the first place, Hegel was an *Idealist*. By this it is meant, however, not that he reduced the facts of the outward world to ideas, or held that there are no facts but the ideas of the individual mind. It is meant only that he held that we must ultimately explain the world as the manifestation of a rational principle. Kant had shown that all known or knowable objects are relative to a conscious subject, and that therefore we cannot legitimately treat them as *things in themselves*—i.e. as things that might exist by themselves even if there were no intelligent principle in existence to know them. He had shown, in other words, that existence means nothing unless it means existence for a self. Hegel carried the argument a step further, and maintained that the world of objects is not only related to an intelligence, but that it can be nothing but the revelation or manifestation of intelligence. In this way he sought not only with Kant to show the impossibility of a materialistic explanation of things, but to prove the necessity of an idealistic explanation of them. He did not therefore deny the reality of the material world, but maintained it to be an imperfect or incomplete reality which could not exist by itself without something else to supplement it. He attempted to prove that matter is the necessary object and counterpart of spirit, in which spirit reveals, and through which it realises, itself; and that indeed the material world only shows its ultimate meaning, when we regard it as the natural environment and basis for the life of spiritual beings.

In the second place, Hegel connected this idealistic or spiritualistic view of things with the great modern idea of *Evolution* or *Development*. That idea is often supposed to involve that the highest and most complex existences may be traced back to the lowest and simplest—that, for example, we may hope ultimately to explain the phenomena of life by mechanics and chemistry, and the phenomena of thought and will by the powers of nutrition and sensation which are manifested in the lowest forms of animal life. And in a similar way the idea of evolution is supposed to imply that we can explain the highest forms of religion as nothing more than refined reproductions of the crude superstitions of savages. Hegel, on the other hand, maintains that, as it is the developed form that first tells us what was in the germ, as it is only the life of the man that shows what was latent in the child, so under the idea of evolution we must take the man as explaining the animal, and the

organic as exhibiting what is latent and obscure in the inorganic. Not, indeed, as if the special sciences of mechanics, chemistry, biology, &c. were not right in keeping to their own special principles. But, in the last resort, when we attempt, as it is the business of philosophy to attempt, to see all these spheres of existence in their relation to each other, as well as to the intelligence that knows them, we must regard nature as becoming self-conscious—i.e. as revealing its secret meaning only *to* and *in* man; and we must find the key to the secret of man's nature in the highest energies of his moral and intellectual life.

Finally, in attempting to work out this idea of evolution Hegel teaches us to regard it as a *progress by antagonism*. While, therefore, there is a unity of principle in all things that exist, yet, in order to develop, this principle must differentiate itself, must manifest itself in different forms, and these forms must inevitably come into conflict with each other. In truth, however, the forms which have thus come to be opposed are really complementary or necessary to each other, and therefore their conflict is limited by the unity which they express, and which ultimately must subordinate them all to itself. This idea may be most easily illustrated by reference to the unity of the social organism, which manifests itself in a division of labour between its members. In developing their powers these members are brought into antagonism with each other; but if their conflict and competition is not to destroy the society, it must be subordinated to their co-operation. That the organic unity of the society should maintain itself means, therefore, that there should be such community between its members that all their conflict and competition should only lead to a better distribution of functions between them, and should thus contribute to direct and improve the life of the society as a whole. This illustration may give some clue to the principle which Hegel works out in application to all spheres of the life of nature and of man. On it is based Hegel's ultimate division of philosophy into the three departments—logic, or the science of thought in its pure unity with itself; the philosophy of nature, in which the ideal principle, which is supposed to exist in all things, is shown to underlie even the externality of the material world; and the philosophy of spirit—i.e. of the life of man as a self-conscious being, standing in relation to a material world, which seems to be altogether external to him, and yet subordinating it to his own life. But these words are the indication of ideas which it would take many pages fully to explain.

Hegel's collected works, edited by a number of friends and disciples, appeared after his death in 18 vols. (1832–45). On his life and philosophy, see Rosenkranz, *Hegels Leben* (1844), *Apologie Hegels* (1858), and *Hegel als Deutscher Nationalphilosoph* (1870); Haym, *Hegel und seine Zeit* (1857); Kostlin, *Hegel* (1870); the histories of this period of German philosophy by Michelet (1838), Chalybaus (5th ed. 1860), and especially Erdmann (vol. iii. 1848–53); Hutchison Stirling, *Secret of Hegel* (2 vols. 1865); Wallace, translation of the *Logic* from the *Encyclopædia*, with prolegomena (1874); E. Caird, *Hegel* (in 'Philos. Classics' series, 1883); Seth, *The Development from Kant to Hegel* (1882); *Hegel's Æsthetic*, by Kedney, *Hegel's Logic*, by W. T. Harris, *Hegel's Philosophy of Religion*, by A. M. Fairbairn, *Hegel's Philosophy of History and the State*, by G. S. Morris (Chicago, 1886–90). There are translations of Hegel's *Philosophy of History*, by Sibree (1857), of the *Philosophy of Right*, by Dyde, of the *Philosophy of Art*, by Hastie and by Bosanquet, of the *Philosophy of Religion*, by Speirs and Sanderson, and of the *History of Philosophy* (3 vols. 1892–96), by Miss Haldane.

At the time of Hegel's death his philosophy was dominant in Germany; and at that time there seemed to be a consensus among his pupils as to its interpretation. But division soon arose between those who, following the apparent tendency of their master, interpreted the principles of Hegelian philosophy in an orthodox and conservative spirit, and those who emphasised its negative dialectic, and used it as a weapon of attack against the existing order of church and state. After the appearance of Strauss's *Leben Jesu* (1835) the school may be regarded as having broken up into 'Old Hegelians,' or 'the Right'—Hotho, Gabler, Erdmann, Daub, Marheineke, Göschel; 'the Centre'—Rosenkranz, Gans, Vatke, Conradi; and 'the Left,' the 'Young Hegelians'—Strauss, Michelet, Feuerbach, Bruno Bauer, Ruge, Karl Marx—of whom some even maintained that the legitimate development of the philosophy was found in atheism, materialism, and communism. The result of these controversies was that the Hegelians almost ceased to exist as a definite school; but the ideas of Hegel still retain their power, and form one of the most important elements in modern culture. Many who cannot be regarded as in any strict sense Hegelians have owed their main philosophic stimulus to Hegel—such as F. C. Baur, Schwegler, Zeller, Kuno Fischer; and the so-called 'Pseudo-Hegelians' I. H. Fichte, Weisse, Chalybäus, Ulrici, Carrière. Hegelianism is the most important element in the philosophy of the popular pessimist Von Hartmann. Out of Germany, Hegelianism is represented more or less directly by Heiberg and Martensen in Denmark; in France, by Leroux, Prevost, and others; in Italy, by Vera and Mariano; in Britain, by Hutchison Stirling, J. Caird, E. Caird, Wallace, Green, and Bradley; in America, by W. T. Harris and others.—Hegel's eldest son, Karl (born 1813), became distinguished as an historian, and was professor of History successively at Rostock and Erlangen.—Another son, Immanuel (1814–91), held high administrative offices under the Prussian government, and was leader of the Conservative and High Church party.

Hegesippus, the earliest of the Christian church historians; of his life we know nothing save that he was almost certainly a Jewish convert and that he flourished about the middle of the 2d century. From a statement of his own, preserved in Eusebius (iv. 22), we learn that he made a journey to Rome, visiting Corinth upon the way, and when at Rome compiled a list of the bishops of the Roman see down to Anicetus (156–67 A.D.). Further, he is represented as adding 'to Anicetus succeeds Soter; and to Soter, Eleutherus' (175–89). Hegesippus must thus have written most of his history previous to 167 A.D., and he most probably published it early in the episcopate of Eleutherus. This agrees well with the statement of St Jerome that Hegesippus had bordered on the apostolic age (*vicinus apostolorum temporum*), for if born so early as 120 he came very near the age of St John. His work was entitled *Five Memorials of Ecclesiastical Affairs*, and appears not to have been a complete and continuous history, although extending from the death of Christ to the writer's own age. Unhappily it survives only in a few fragments which Eusebius had embodied in his own history, the most important of which are his account of the martyrdom of St James and also of St Simeon of Jerusalem. Eusebius commends his doctrinal fidelity, and St Jerome the simplicity and unpretentiousness of his style. The question has been much discussed whether Hegesippus belonged to the Judaising Christian party or not. Baur went so far as to pronounce him a declared enemy to St Paul, relying mainly upon a passage preserved in Photius, in which Hegesippus declares that an opinion of many, corresponding exactly to what is said in 1 Cor. ii. 9, is contradictory to the express word of the Lord himself in Matt. xiii. 16. But it is much more likely that Hegesippus is here aiming at the Gnostic misconception of these words rather than that of St Paul, for the reference is obviously to their claims to special spiritual insight; while a further passage preserved, used by the Tübingen school to fortify their inference—viz. that those who were

trying to destroy the sound rule of saving doctrine as yet had themselves in holes of darkness can by no possibility be understood as a reference to the heedless and vehement apostle of the Gentiles.

The fragments of Hegesippus will be found in vol. i. of Routh's *Reliquiæ Sacræ* (1847), and in vol. ii. of Grabe's *Spicilegium*.

Hegira, Hejira, or Hijra—an Arab word which means 'going away'—the term commonly used to indicate Mohammed's flight from Mecca, 13th September 622 A.D. In 639 or 640 the Calif Omar instituted a new Moslem calendar, to begin with the first day of the first month of the year in which the flight took place. The Mohammedan year, as a lunar year, is shorter than ours by 10 days, 21 hours, and 14 seconds. A rough and ready method for finding the year in our calendar corresponding to a given year in the Mohammedan is to subtract from the latter $\frac{3}{100}$ of itself and add 622 to the remainder. To find the precise year and day, multiply the year of the Hegira by 970224, strike off from the product six decimal figures, and add 621·5774; this will give the year of the Christian era; and the day of the year is got by multiplying the decimal figures by 365.

Heiberg, the name of two Danish authors. See Denmark, Vol. III. p. 759.

Heide, the chief town of northern Ditmarsh, in the Prussian province of Sleswick Holstein, 58 miles by rail WSW. of Kiel. Chief industries are shoemaking, paper-making, and brewing. Heide is the birthplace of Klaus Groth. Pop. 7355.

Heidelberg, an ancient city of Germany, in the grand-duchy of Baden, extends for about 3 miles along the left bank of the river Neckar, in one of the most beautiful districts in the country, 13 miles by rail SE. of Mannheim and 54 S. of Frankfort-on-the-Main. It lies 380 feet above sea-level, at the base of the Königsstuhl (1863 feet). Among its most important buildings are the church of the Holy Ghost, a splendid example of Late Gothic architecture, in which service according to the Catholic and Protestant rituals is simultaneously carried on; the church of St Peter's, on the door of which Jerome of Prague nailed his celebrated *theses*, and the magnificent ruins of the castle, which stand on a hill 330 feet above the town. Begun at the close of the 13th century, and added to in 1410, 1559, and 1607, it was formerly the residence of the Electors Palatine, and was in great part destroyed by the French in 1689 and 1693, and further injured by lightning in 1764. In the cellar under the castle is the famous Heidelberg Tun, once capable of containing 50,000 gallons of wine. Heidelberg is celebrated for its university, which was founded by the Elector Rupert I. in 1386, and continued to flourish until the period of the Thirty Years' War, when it began to decline. In 1802, however, when the town with the surrounding territory was assigned to the Grand-duke of Baden, a new era commenced for the university, and it rapidly became famous. It comprises faculties of theology, law, medicine, and philosophy, has about 110 professors and lecturers, and is attended by about 800 students. Its library consists of some 500,000 volumes and 4700 MSS. Many of the most famous German scholars have been professors here—Reuchlin, Œcolampadius, Spanheim, Puffendorf, Voss, Schlosser, Creuzer, Gervinus, Paulus, Kuno Fischer, Helmholtz, Bunsen, Bluntschli, &c. The quincentenary of the university was celebrated with elaborate ceremonial in 1886. Heidelberg, originally an appanage of the bishopric of Worms, became in the end of the 12th century the seat of the Counts Palatine, and continued to be so for nearly six centuries. After the Reformation Heidelberg was long the headquarters of German Calvinism, and gave its name to a famous Calvinistic Catechism (q.v.). The trade is chiefly in books, tobacco, beer, and wine. The town suffered much during the Thirty Years' War, was savagely treated by the French in 1689, and was in 1693 almost totally destroyed by them. Pop. (1871) 19,988; (1890) 31,739, of whom a third are Catholics and about 800 Jews. See works by Oncken (3d ed. 1885), Drum (1884), and Thorbecke (1886); also *The Century Magazine*, August 1886.

Heights may be determined by four methods: by Trigonometry (q.v.), by Levelling (q.v.), by ascertaining and comparing the atmospheric pressure at top and bottom of the height by the Barometer (q.v.), or by ascertaining and comparing the boiling-point of water at the top and bottom by the Thermometer (q.v.). See also Surveying.

Heijn, or Heyn, Piet, a famous Dutch admiral, was born in 1570 at Delftshaven, near Rotterdam. After an adventurous career, he became vice-admiral under the Dutch East India Company. In 1624 he sailed to South America and defeated the Spaniards near San Salvador (Brazil), and again in 1626 in All Saints' Bay (Bahia), when he took above twenty of their ships, returning to Holland with an immense booty. Two years later he captured the Spanish silver flotilla, the value of which was estimated at 16,000,000 Dutch guilders. As a reward for this success he was in 1629 named Admiral of Holland. On 20th August of the same year he met his death in a sea-fight against the privateers of Dunkirk off that town. A marble monument is erected to his memory in the old church at Delft.

Heilbronn, a town of Würtemberg, situated on the right bank of the Neckar, in a beautiful and fertile region, 28 miles by rail N. of Stuttgart. The streets of the old medieval town are narrow, and the houses have quaintly ornamented gable-ends and tapering pinnacles. The church of St Kilian, partly Gothic and partly Renaissance; the old town-hall; the *Diebsthurm* ('Thief's Tower'), in which Götz von Berlichingen was confined; and the house of the Teutonic Knights, now a barrack, are the principal buildings. The chief industries include the manufacture of silver-plate, paper, sugar, salt, chicory, and chemicals, and there are iron and other metal foundries and machine-shops. Fruit and wine are largely grown. Commercially the importance of Heilbronn depends upon its trade in groceries, corn, and wood, and upon its fairs for cattle, leather, wool, and fruit. In the vicinity gypsum and sandstone are quarried. Heilbronn is first mentioned in 741; in 1360 it became an imperial town; it suffered during the Peasants' War and the Thirty Years' War, and in 1802 it fell into the hands of Würtemberg. Pop. (1875) 21,208; (1890) 29,941.

Heiligenstadt, a Catholic town of Prussian Saxony, situated on the Leine, 32 miles ENE. of Cassel by rail, has manufactures of cotton, cigars, paper, and pins. Pop. 5861.

Heilsberg, a town of Prussia, 40 miles S. of Königsberg. It was originally the chief town of Ermeland, one of the old divisions of Poland, and received town rights in 1308. Here the allied Russians and Prussians under Bennigsen defeated the French under Soult and Murat on 10th June 1807. Pop. 5705.

Heilsbronn, a Bavarian village of middle Franconia, 16 miles SW. of Nuremberg by rail, was the seat of a celebrated Cistercian monastery, which owed its origin to Bishop Otho of Bamberg in 1132. Nearly all the burgraves of Nuremberg were buried here till the end of the 15th century,

when it became the burial place of the Franconian branch of the Hohenzollerns. Although the monastery was suppressed in 1555, the church still retains a large number of highly-interesting sepulchral monuments and other examples of medieval German art. See works by Stillfried (1877) and Muck (3 vols. 1879–80).

Heimskringla. See SNORRI STURLASON.

Heine, HEINRICH, the most prominent figure in German literature since Goethe and Schiller, was born of Jewish parents on 13th December 1797, in Düsseldorf-on-Rhine. His boyish heroes were Napoleon and Napoleon's stalwart grenadiers and drummers. At a Roman Catholic school in Düsseldorf he learned what it was to be jeered at and ill-treated on account of his race and creed. At sixteen he was sent to Frankfort to learn banking, but he soon gave it up; routine work was wholly repugnant to him. Next he tried trading on his own account in Hamburg, but soon failed. About the same time he fell in love with a daughter of his rich uncle, Solomon Heine of Hamburg; and his grief at her non-requital of his passion, jealously nursed as it was, formed a stimulus to poetic creation. At length in 1819 his uncle gratified the desire of his heart by sending him to the university of Bonn. There, and subsequently at Berlin and Göttingen, he studied law, taking his doctor's degree at Göttingen in 1825. But his thoughts were more given to poetry and kindred subjects than to legal studies. At Bonn A. W. Schlegel helped him to master the technique of his art. At Berlin, in the circle over which Rahel, the wife of Varnhagen von Ense, presided, he found himself for the first time in a wholly congenial atmosphere; and the close friendship formed between them lasted till Rahel's death. In the efforts then being made in Berlin by Ganz and others to inspire the Jews with a sense of the value of European culture Heine also took an active share. In 1821 he published his first volume of *Gedichte*, which at once arrested the attention of the observant. After unsuccessful essays in tragedy-writing, a second collection of poems, entitled *Lyrisches Intermezzo*, his Sapphic love-plaint, appeared in 1823. But the general public only became aware that a new writer of the first magnitude had risen in the heavens of literature when in 1826–27 the first and second volumes of the *Reisebilder* came into their hands. In the latter year Heine likewise celebrated his triumph as conqueror of a new poetic province in *Das Buch der Lieder*, which, though consisting almost entirely of poems already published, created throughout Germany such excitement as had not been since Schiller's *Räuber* came out. Many of Heine's best songs are as much loved for the beautiful melodies to which they were set by Schumann and Mendelssohn as for their own intrinsic merit.

These two works are Heine's masterpieces; he never wrote anything to excel them. Nearly all his writings are of an occasional nature, either lyrical, or autobiographical, or journalistic, or polemical. But the genius in them is permanent, and in many respects of the highest quality. The great charm of his work is due to the fact that he was a superb literary artist, a consummate master of style in both verse and prose. He was essentially a lyrist; his song has the spontaneity and melody of a skylark's burst, or the quaint naïveté, the pathos, the simple sweetness of the best *Volkslieder*. His was a very complex and paradoxical nature: he united in himself the passionate energy of a Hebrew prophet, the sensuous feeling of a pagan Greek, and the dreamy sentimentalism of a medieval German. The simplicity of a pure child of nature is blended with the keenest wit, with an irony that is apt to grow bitterest when his lyric mood is sweetest, and a power of mocking sarcasm that cuts sharp and deep. His mastery in the art of self-torture taught him how to lash the follies and absurdities of the conventional world with the roughest rawhide of Mephistophelean scorn. His writing is full of surprises, as capricious as the sea he loved so passionately. His intellect has the suppleness and grace and sinewy strength of a highly-trained athlete, but it neither walks nor glides; it leaps, and turns and doubles with the glancing swiftness of a swallow on wing. He passes from exquisite tenderness to sardonic cynicism, from melancholy sadness to sly insidious humour, in the twinkling of an eye. Nor is sweet dreamy sentiment in him any hindrance to remarkable precision of thought. But perhaps his strangest quality is an audacity of intellect that hesitates at no utterance, that recoils from no jest on things even the most sacred. His language is terse, clear, and rich in word-pictures, mostly original, seldom glittering with the tinsel of mere conventional imagery. One of his favourite devices is to mingle the images of dreamland, unearthly and weird, with images of true poetic beauty forged from the raw ore of commonest reality. But, notwithstanding his delicate poetic sensibility, and the depth and sincerity of his feeling, his poetry had its origin in dissonance of soul; the *Weltschmerz* had eaten deeply into his heart. The prophet of poetic pain, he scruples not to lay bare his soul to us without reserve; we see the man just as he is, with all his beauties, with all his faults. And these last are neither few nor venial. His sensuousness often degenerates into obscenity and coarseness, his wit into vulgarity and affectation, his irony into malice and persiflage. He becomes cynical, frivolous, a mocker. Not only does he show no sense of reverence himself, he wantonly outrages the reverent feelings of his readers. And he has just 'feminity' enough in his constitution to find pleasure in spiteful personalities.

In June 1825 he had himself baptised a Christian, exchanging his original name Harry for Christian Johann Heinrich, though he used only the last of the three. This step, which proved to be one of the most unfortunate of his life, was not taken from conviction, but simply to secure for himself the common rights of German citizenship, and to give himself a respectable standing in the world. Heine, however, by this act only alienated from him the esteem of the orthodox among his own people. His revolutionary opinions, and his trenchant and outspoken criticism of the governments of the day, always remained insuperable hindrances to his appointment to any official employment in Prussia, and even in Germany. During the years of early manhood, from 1823 onwards, he was racked by excruciating headaches, which reacted upon his temper and his mood. Then again, he lived on a strained footing with his Hamburg relatives; they were shrewd business folk, and could see no virtue in poetship, and nothing 'divine' in the poet himself—and Heine was inclined to presume upon his success. He was always greatly harassed by the unscrupulous tyranny of the public censor: his works came from the press grievously maltreated, and against this injustice he could get no remedy. Moreover, he felt himself coming perilously near to the doors of a German fortress-prison. No wonder then that, when his enthusiasm was roused by the July revolution in Paris, he turned his back upon Germany and hastened thither, going into a voluntary exile from which he never returned. But he had not been altogether idle during the six unhappy years since 1825. He had travelled

to England and Italy, he had worked on the editorial staff of Cotta's newspapers in Bavaria; and, besides *Das Buch der Lieder*, he wrote four volumes in all of *Die Reisebilder*, the last two (1830-31), however, inferior to the others.

In Paris Heine, whose intellectual character and intellectual sympathies were always more French than German, soon made himself at home. He seemed a patron in the minister Thiers, and consorted with the greatest writers and chief celebrities then living in Paris; and yet he often longed to return to the Philistines of Germany. For, in spite of the fact that he railed at his Jewish descent and poured scorn upon his German compatriots, he was always a German at heart and had a secret admiration for the persecuted people from whom he was sprung. Nor was this by any means the only inconsistency in his nature. Though he scoffed at religion, yet was there a deeply religious vein in his composition—the Bible was always a favourite book with him; though he was deplorably lax in his ideas and practices of morality, he was not insensible to the beauty of purity; and though he ridiculed the vagaries of the romantic school, he cherished a lingering fondness for its ideals.

The July revolution seems to have awakened in Heine the first stirrings of manly seriousness. He turned from poetry to politics, with which he had always coquetted ever since he began to write. He entered Paris glowing with the inspiration of the revolution. He assumed the rôle of a tribune of the people, a leader of the cosmopolitan democratic movement, the object of which was to effect the union of the peoples of all nations in a brotherhood of liberty and progress. It was under the inspiration of this ideal that he greeted with acclamation the socialistic doctrines of the St Simonists, at all events in so far as economics and religion were concerned. One of the chief aims of his life was to make the French and the Germans acquainted with one another's intellectual and artistic achievements. This was the ground out of which sprang the *Französische Zustände* (1833), a collection of papers on affairs in France, first printed in the *Augsburger Allgemeine Zeitung*; *De l'Allemagne* (1835), the French version of *Die Romantische Schule* (1836) of Germany, that is; and *Zur Philosophie und Literatur in Deutschland*, forming part of the second of the four volumes of miscellaneous writings entitled *Der Salon* (1835-40). Heine was always an Ishmael, not only of literature but also of politics—he would fight under nobody's flag but his own; and hence, with his aristocratic instincts and refined taste, he refused to make common cause with the revolutionary fugitives from Germany who found an asylum in Paris. Yet he seems not to have been altogether above the suspicion, if not of insincerity, at least of desiring to win the crown of the political martyr without undergoing the pains of political martyrdom. At all events, his ambiguous attitude brought down upon him the spiteful enmity of his revolutionary compatriots; and their hostility was greatly embittered by the publication of Heine's ungenerous attack upon his former friend and political associate Börne (1840). Nor did he enjoy any better savour of grace from the governments of Germany because of his personal aversion to their dreaded enemies. In 1835 his writings, past and prospective together, had been condemned, along with those of the Young Germany school, by the Confederation parliament at Frankfort, and this measure was not repealed until 1842.

Although Heine loved liberty with his whole soul, and lived and suffered for it, it seems never to have been anything more to him than a romantic ideal. The truth is he stood on the continental watershed of two wholly different *Weltanschauungen* ('world-conceptions'), the old world of romantic feudalism and the new world of scientific inquiry and individual freedom. He had nothing but scorn for the tyrannous era of priestcraft and aristocracy, and nothing but sarcasm and ridicule for the inert mass of commonplace Philistines, with their intellectual apathy and self-satisfied somnolence. Respecting the future he cherished the most sanguine hopes. He foresaw in imagination the glorious regeneration of the peoples; and Germany was, he believed, the agent of promise destined to effect this great change. Nor must it be imputed to him for blame that he never grasped the problem of the practical realisation of his ideal, that he never thought of the means and forms by and in which this romanticism of the revolution of progress was to be converted into the concrete realism of accomplished fact. For, though he criticised the past and projected his hopes into the future, his heart was knit to the past with the tenderest associations of feeling, and his sceptical intellect would not allow him to remain blind to the imperfections of his prospicient dreams. It need not therefore excite surprise to find traces of the sentimental declaimer in Heine's war-song of liberty, despite his evident earnestness in the cause. For, after all, his love for humanity was beyond all suspicion warm and deep, and his zeal for intellectual freedom unquestionably sincere.

His last years, from 1844 onwards, were years of great pain and suffering. His book on Börne provoked a kind of hornet's nest about his ears. On the eve of a duel, which it ultimately cost him, he married in due legal form Mathilde Mirat, a Paris grisette, with whom he had been living some years in free love. Then came his uncle Solomon's death, and a quarrel with the family, because of their refusal to continue the annuity he had received from his uncle from the year he settled in Paris. A compromise was effected early in 1847: the payment of the annuity was resumed, Heine pledging himself not to publish anything reflecting on the family. For this reason his *Memoiren*, which he anticipated would be his greatest work, was withheld from publication. The fate of the manuscript is a mystery. Heine speaks of having destroyed it. Yet it is both asserted and denied that it passed into the possession of his brother Gustav. At all events the fragmentary *Memoiren* published in 1884 can scarcely be part of the original work; it is in all probability a portion of the new version begun by Heine. The revolution of 1848, unlike that of 1830, failed to awaken any enthusiasm in him. Since 1837 his eyes had caused him much pain, and since 1844 he had been confined to his bed by spinal paralysis. He lingered on in excruciating pain, borne with heroic patience and endurance, until 17th February 1856. But no amount or intensity of bodily suffering could break his spirit or impair his creative power; he jested and wrote to the last. During these years he published *Neue Gedichte* and *Deutschland*, a satirical political poem, in 1844; *Atta Troll*, the 'swan-song of romanticism,' in 1847; a collection of poems, *Romancero*, in 1851; and three volumes of *Vermischte Schriften*, in 1854.

Complete editions of Heine's works have been edited by Strodtmann (21 vols. 1861-66), Karpeles (12 vols. 1885 and 9 vols. 1886-87), and Elster (5 vols. 1887), and in French by himself, assisted by Gérard de Nerval and others (14 vols. 1852 *et seq.*). The best biographies of Heine are those by Proelss (1886) and Strodtmann (3d ed. 2 vols. 1884). See also *Heines Autobiographie* (a mosaic) by Karpeles (1888), and Lives by W. Sharp (1888) and Stigand (1875). Heine's poetry has a fatal fascination for translators. Versions have been essayed by

Ackerlos (1854), Wallis (1856), Bowring (1859), Lord Lytton, Sir Theodore Martin (1879), J. Geikie (1887), and others. Heine's works have been translated by Leland (vol. i. 1891), and parts of the prose by Stern (1873), Snodgrass (1882), Storr (1887), Havelock Ellis (1888), R. M'Clintock (1890), &c. *Wit, Wisdom, and Pathos*, extracts from Heine's prose, translated by Snodgrass (1879; 2d ed. 1888), may also be consulted.

Heineccius, JOHANN GOTTLIEB, a jurist of Germany, born 11th September 1681 at Eisenberg, was professor of Philosophy at Halle from 1713, and from 1720 professor of Law. In the latter capacity he went in 1723 to Franeker, and in 1727 to Frankfort-on-the-Oder; but in 1733 returned, as professor of Law and Philosophy, to Halle, where he died 31st August 1741. Heineccius belonged to the school of those who treat law in dependence upon philosophical principles. His chief works were *Antiquitatum Romanorum Jurisprudentiam Illustrantium Syntagma* (1718); *Historia Juris Civilis Romani* (1733); *Elementa Juris Germanici* (1735); and *Elementa Juris Naturæ et Gentium* (1737; Eng. trans. 1763). His *Opera Omnia* (9 vols.) were edited by his son in 1771.—Heineccius's brother, JOHANN MICHAELIS HEINECCIUS (1674–1722), was a celebrated pulpit orator in Halle, and the first who studied seals scientifically. On this latter subject he wrote *De Veteribus Germanorum aliarumque Nationum Sigillis* (1709).

Heinsius, ANTHONY, Dutch statesman, born at Delft, 22d December 1641, studied law at Leyden, in 1688 became Grand Pensionary of Holland, and as the close friend of William III. (of England) guided Dutch politics till his death, 30th August 1720.

Heinsius, DANIEL, a Dutch classical scholar, was born at Ghent, 9th June 1580; was educated at Franeker and Leyden (becoming the favourite pupil of Scaliger), and became professor at Leyden. He died 25th February 1655. He edited many Latin classics, and published Latin poems and orations of his own.—His son, Nicolaus (1620–81), obtained distinction both as a diplomatic agent and as a classical scholar.

Heir. In primitive systems of law the heir is the person who performs the sacred rites on the death of his ancestor, and to whom, as representing his ancestor, the property of the deceased is transferred. There are traces of this primitive conception in the history of Roman law. The later Roman law regards the heir as an universal successor, on whom all the rights and liabilities of the ancestor devolve. An heir might be named by will; in case of intestacy, the law pointed out the line of succession; in some cases equity gave possession to a person who was permitted by a fiction to call himself heir, though not legally entitled to inherit. The liabilities of an heir were restricted by rules which enabled him to separate his own estate from that of the deceased; after Justinian's time this was done by 'making an inventory;' and this 'benefit of inventory' is a feature of modern codes founded on the civil law. It is to be observed that the Roman heir united in himself the rights of the heir, executor, and devisee of English law.

In English law the heir is not the universal successor, but the person who succeeds to the *real* property of a deceased person not disposed of by will. He is bound by covenants, &c. which have been made binding on the land; the property which descends to him has been made assets for payment of debt generally; but if the personal estate be sufficient, the executor is the person by whom debts should be paid. The heir is ascertained at the moment of death; thus it is not technically correct to speak of the eldest son of a living person as his heir; the son is *heir-apparent*—i.e. it is evident that he will be the heir if he survives. If a father or brother is nearest in succession to a living person, we call him *heir-presumptive*; he will be the heir if he survives, and if no nearer heir is born. An heir must be sought among persons related by consanguinity to the deceased, males being preferred. Of males in the same degree, the eldest is sole heir; females in the same degree succeed as co-heiresses or coparceners. By the Inheritance Act of 1833 it is directed that descent is to be traced from the last purchaser—i.e. the last person who acquired the land otherwise than by descent. Formerly an estate could not ascend from son to father; but the act places the father next in succession after children and other descendants. For a tabular view of the order of succession, see Williams, *On Real Property*, or Paterson's *Compendium of English and Scotch Law*. The *heirs-general* are the heirs ascertained according to the foregoing rules, as distinguished from the restricted class (heirs of the body, heirs-male, heirs-female, &c.) pointed out by the terms of an entail. Where no heir can be found, the land is escheated to the feudal superior to whom it is held—i.e. usually to the crown. When a person dies intestate, his real estate vests at once in the heir; the heir becomes seised in law without entry on the estate or other formality. The rule which permits an heir to shift the liability for debts to the personal estate was formerly applied even to mortgages; but Locke King's Act, passed in 1854, makes a mortgage debt a charge on the land, unless a contrary intention is expressed.

The law of succession in Ireland is the same as in England.

In Scotch law the term heir is less strictly defined than in English law. It is used to include persons who succeed to movables. It also includes persons who take, not by descent, but by gift; thus, for example, 'heirs of destination' or 'heirs of provision' would be described as devisees or donees in English law. 'Heir-apparent,' in Scots law, means an heir who has not made up his titles, the heir-apparent of English law being included under the name of heir-presumptive; but since the Conveyancing (Scotland) Act of 1874 the inheritance vests on the death of the owner, and the heir is not required to make up titles. By the same act it is provided that an heir shall not be liable for the debts of his ancestor beyond the value of the estate. When heritable property has not been settled or disposed of by the owner, the *heir of line* is sought among the legitimate kin of the deceased. As in England, males are preferred; of males in the same degree, the eldest is sole heir; females inherit together as 'heirs-portioners.' But in Scotch, as compared with English law, certain points of difference are to be observed. (1) After descendants are exhausted, it is not the father, but the next younger brother who is next in succession; then the next younger again, and so on to the youngest brother, after whom and his descendants comes the next elder brother, and so on up to the eldest brother. Formerly 'fee of conquest'—i.e. land purchased by the deceased—went to the next elder brother, and so on, in preference to the next younger; but the distinction between conquest and heritage was abolished in 1874. (2) The mother never succeeds in Scotland, nor any relatives who trace through her, except brothers and sisters german. (3) Persons born illegitimate, but rendered legitimate by the subsequent marriage of their parents, are permitted to succeed. See the comparative tabular view in Paterson's *Compendium*.

In England the term 'hereditaments' is used to denote those parts of a man's property which will, if not disposed of, descend to the heir. In Scotland heritable property includes leaseholds, which in

England are treated as personal property; certain classes of annuities are also heritable, which would in England be personal.

HEIRS-PORTIONERS, in Scotch law, mean either two or more females, being sisters, or sisters and the children, male and female, of deceased sisters, who are entitled to succeed to heritable estate when their ancestor dies without leaving male issue. Thus, if A dies leaving three daughters, all three succeed equally if alive; or if some have already died leaving children, then the children represent the parent, and succeed to the parent's share along with the surviving sisters, all being called heirs-portioners. In such cases the eldest heir-portioner is entitled to the mansion-house of an estate in the country over and above her equal share of the rest. But she has no such right to a house in town, or to a country villa. She alone also takes a peerage or dignity, if there is any in the family. In England coparceners, though resembling heirs-portioners, have not identical rights.

Heirloom (compounded of *heir* and *loom*, originally a 'piece of property,' 'furniture'), in English law, means a chattel, or movable thing, which goes to the heir-at-law by special custom. But the right is obscure. The word is more frequently used now to designate chattels bequeathed or settled so as to be enjoyed by the person for the time being in possession of a family estate or mansion. In Scotland a somewhat similar but by no means identical phrase is used—viz. *heirship movables*, which is a wider right, and includes the best articles of furniture in the house of a person who left heritable property. The extent of this right is also not clearly settled.

Hejra. See HEGIRA.

Hel, in Northern Mythology, the goddess of the dead, the sister of the wolf Fenrir, and daughter of the evil-hearted Loki (q.v.), by the giantess Angurboda. The All-father hurled her down into Niflheim, and gave her authority over the lower world, where she received all who died of sickness and old age. She was of fierce aspect, and had a half black, half flesh-coloured skin. To her were assigned the characteristics of insatiable greed and pitilessness. After the introduction and diffusion of Christianity the ideas personified in Hel gradually merged, among all the races of Scandinavian and German descent, in the local conception of a Hell (q.v.), or dark abode of the dead.

Helder, THE, a thriving seaport and strongly-fortified town in the Dutch province of North Holland, 51 miles by rail NNW. of Amsterdam. It stands on the Marsdiep, which connects the Zuider Zee and the German Ocean, and at the northern extremity of the North Holland Canal, by which, too, it has connection with Amsterdam. It is one of the strongest fortresses in Holland, having been first fortified by Napoleon in 1811, and has several naval establishments, including an arsenal and a college, and an excellent harbour. Pop. (1895) 25,254. Nieuwe Diep, half a mile east, is the port at the main outlet of the North Holland Canal.

Helderberg Formation. In North America a division of the Silurian strata is called (after the Helderberg Range, in the east of New York state) the Lower Helderberg formation. It appears to be on the horizon of the English Ludlow beds. The Upper Helderberg formation of North America is a member of the Lower Devonian strata.

Helen, the most romantic figure of antiquity, famous for her beauty and the misfortunes that followed in her train. She was the daughter of Zeus and Leda, wife of the Spartan king Tyndareus, and owed her more than mortal loveliness to her divine origin. At the age of ten she was carried off by Theseus and Pirithous, but was soon recovered by her brothers Castor and Pollux, of whom the latter was half an immortal like herself. She was sought in marriage by all the noblest Greek princes, whom her father bound by an oath to respect the choice which Helen herself should make. She chose Menelaus, and bore to him the fair Hermione. When she was carried off by Paris, son of Priam of Troy, through the connivance of Aphrodite, Menelaus mustered all the Greek princes to revenge the wrong, and thus the famous ten years' Trojan war began. After the death of Paris, not long before the fall of the city, Helen was married to his brother Deiphobus, and she is said to have betrayed him to Menelaus and so regained her husband's love. With him she returned to Sparta, and there lived the rest of her life in quiet happiness. The pair were at last buried together at Therapnæ in Laconia, although, according to the prophecy of Proteus in the *Odyssey*, they were not to die, but to be translated to Elysium. Another story makes Helen survive Menelaus, and be driven out of the Peloponnesus by his sons. She fled to Rhodes, and was there tied to a tree and strangled by Polyxo—a crime expiated only by the Rhodians building a temple to her, under the name of *Helena Dendritis*. Yet another tradition makes her marry Achilles on the island of Leuce, and bear him a son, Euphorion.

In the Homeric poems Helen survives as the personification of all grace and loveliness. She is the daughter of Zeus, although there is no mention as yet of the swan story of her mother's wooing by the god. Into the conception of her character in the *Iliad* there enters but little sense of moral responsibility, perhaps because she is a personage that has come into history from the world of mythology, which is ever innocent of morals. In the *Odyssey*, again, we find an incipient sense of moral responsibility, the burden of which is, however, shifted from the shoulders of Helen on to those of some god (*Od.* xxiii. 222). It is true, however, that *Iliad* ii. 356 and 590 may fairly be interpreted to convey the meaning that Helen was carried away by force, an unwilling victim of Aphrodite. Still the fact remains that there exists a notable difference of tone about this question, and this is not unfairly advanced as one of their strongest arguments by those who claim a later date for the *Odyssey* than the *Iliad*. Others, again, contend that in the *Iliad* there is a no less distinct sense of moral responsibility, pointing out that in iii. 164 and vi. 357 there is blame distinctly imputed to the gods, and that in iii. 173–176 and vi. 344 Helen takes the burden of the guilt upon herself. Among her warmest apologists are Mr Gladstone and Mr Andrew Lang. Indeed the former makes bold to say that 'her self-abasing and self-renouncing humility come nearer, perhaps, than any other heathen example to the type of Christian penitence.'

Pausanias tells us that on the chest of Cypselus, a work of the 7th century B.C., Menelaus was represented as rushing on to kill Helen; and, according to a statement attributed to Stesichorus, the Achæan host were about to kill her when their hands were stayed by the power of her beauty. In his *Troades* Euripides makes Helen plead her cause to Menelaus with sophistical rhetoric; in the *Helena* he makes her remain in Egypt, the Greeks and Trojans fighting merely for a shadow formed by the gods out of cloud and wind. Again, in his *Cyclops* the giant speaks of Helen in a manner far removed from the high chivalry and tenderness of Priam and of Hector. In the *Æneid* we are invited to behold the hero about to slay Helen crouching in terror in the temple of Vesta, and only saved from this infamy by the inter-

position of Venus. 'Hundreds of years later,' says Mr Lang, 'Helen found a worthier poet in Quintus Smyrnæus, who in a later age sang the swan-song of Greek epic minstrelsy.' As the personification of all feminine loveliness, she was conjured up to play a part in the dream of Faust, whose words of wonder at the vision of her beauty in Marlowe's tragedy are almost worthy of their theme:

> Was this the face that launched a thousand ships,
> And burnt the topless towers of Ilium! . . .
> Oh, thou art fairer than the evening air
> Clad in the beauty of a thousand stars.

The loves of Faustus and Helen in the second part of Goethe's *Faust* typify the union of the classical and romantic spirit. She is its spiritual heroine throughout, and by his union with her in the fourth act Faust is raised infinitely rather than degraded in character. Last among the greater poets who have felt across the centuries the spell of Helen's loveliness are Walter Savage Landor and Tennyson; the former in some of the finest lines in his *Hellenics* commemorates the power of her beauty to disarm the anger of Menelaus; the latter has painted for us this 'daughter of the gods, divinely tall and most divinely fair,' in his splendid poem, *A Dream of Fair Women*. Poets and poetasters since have touched the theme, but deserve not even to be named together with these.

Helen will remain to posterity what she is in the *Iliad*, one of the most splendid creations in the whole world of art—a queen of beauty supreme over the human imagination, as she was when she went at the summons of Iris, all draped in silvery white, with her three maidens, to the walls of Troy. There above the gate sat the venerable King Priam among his counsellors, and all marvelled greatly at her beauty. 'No marvel is it that Trojans and Achæans suffer long and weary toils for such a woman, so wondrous like to the immortal goddesses' (*Iliad*, iii. 156–158).

See the delightful essay appended to Andrew Lang's fine poem, *Helen of Troy* (1882).

Helena (pronounced, contrary to the classical quantity, *Helē'na;* as is also the island *St Helena*), capital of Montana, is situated among foot-hills in the Prickly Pear Valley, about 14 miles from the Missouri River, with the Rocky Mountains rising behind the city to the south. It is the commercial and railway centre of the state, connected with the Manitoba and Northern Pacific railways, and by branch-lines with several mining camps. Many of the streets are wide and straight, shaded with rows of cottonwood-trees, and faced with handsome residences and business premises; and the city has now electric lights and horse-tramways. The most prominent building is the county court-house, containing the Montana government offices; there are also a government assay office, several churches, schools, and libraries, and a Catholic academy and convent, hospital, and asylum for the insane, besides quartz, flour, and lumber mills. A board of trade was organised in 1887. Gold was found here in July 1864, the first log-cabins were erected in September, and the camp was known as Last Chance Gulch until December, when it received its present name. Pop. (1880) 3624; (1890) 13,834.—There is another Helena in Arkansas; pop. 5185.

Hel'ena, the name of several female saints of the Catholic Church, the most celebrated of whom is the Empress Helena, wife of Constantius Chlorus, and mother of Constantine the Great. Whether born in Bithynia, Britain, or at Treves, she became a Christian during the youth of Constantine, but it was not till after the defeat of Maxentius that she formally received baptism. The few remaining years of her life she gave to works of benevolence. In 326, according to almost contemporary tradition, she visited Jerusalem, and there, with Bishop Macarius, discovered the Holy Sepulchre and the cross of Our Lord. Along with it were the crosses of the two thieves, but which was the true cross was shown by its touch restoring a sick lady to health. St Helena died, it is said, a nun, at the age of eighty. Her festival falls on 18th August. See CROSS, and works cited there.—Two other women of the same name are honoured as saints. The first, whose cult is confined to the Russian Church, was the wife of the Grand-duke Igor, and at her baptism in Constantinople (955) changed her original name, Olga, into Helena; the other was a native of West Gothland, and lived in the 12th century.

Helensburgh, a favourite watering-place of Scotland, in the county of Dumbarton, is pleasantly situated on the right bank of the Firth of Clyde, at the entrance to the Gareloch, 4 miles N. of Greenock by water, and 23 miles NW. of Glasgow by a railway opened in 1858, and extended to Fort William in 1894. It was founded in 1777 by Sir James Colquhoun, and named after his wife Helen. There is an obelisk to Henry Bell (q.v.). Pop. (1871) 5975; (1881) 7693; (1891) 8409; but in summer the numbers are nearly doubled.

Heliacal (Gr. *hēlios*, 'the sun'), emerging from the light of the sun or passing into it. A star's *heliacal rising* is when it rises just before the sun.

Heliand, the name of an Old Saxon poem, dating from the 9th century. Its subject is the life and work of Christ, constructed as a harmony of the four gospels. The poem is written in alliterative verse, in the spirit of the old Low German popular poetry. Besides being the most important relic of the Old Saxon dialect, it is not without intrinsic literary merit. Of two extant MSS. one is in the British Museum; the other is at Munich. Heyne has issued a critical edition of the text (3d ed. 1883), and there is a translation into modern High German by Simrock (3d ed. 1882).

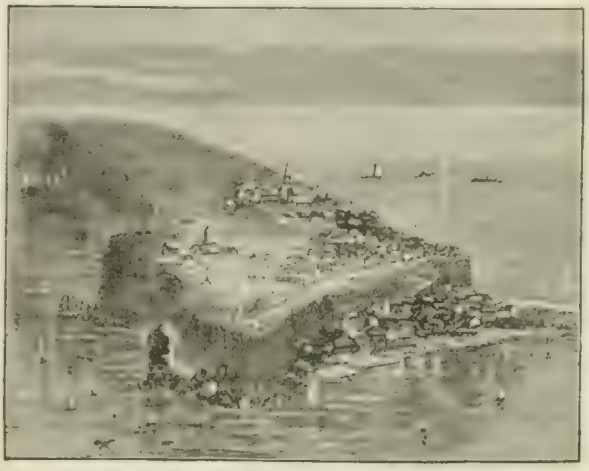
Helianthus. See JERUSALEM ARTICHOKE, and SUNFLOWER.

Helicidæ (Gr. *helix*, 'a spiral'), a large family of terrestrial air-breathing (pulmonate) gasteropods, of which Snails (q.v.) are familiar examples.

Helicon, a mountain-range (5736 feet) in the south-west of Bœotia, in ancient Greece, was celebrated as the favourite seat of the Muses. At the foot of the range stood the village of Ascra, the residence of Hesiod, and the seat of the earliest school of poetry in Greece. On the slopes were the famous fountains of Aganippe and Hippocrene, whose waters were reputed to give poetic inspiration.

Heligoland (Ger. *Helgoland;* native name, *det Lunn*, 'the Land'), a small island in the North Sea, belonging since 1890 to Germany, is situated about 36 miles NW. of the mouth of the Elbe, in 54° 11′ N. lat. and 7° 51′ E. long. It is about a mile long from north to south, and one-third of a mile from east to west, and three-fourths of a square mile in superficial area. The *Oberland* is a rock, 206 feet in height, on which stands a town of 400 houses, and access to which is obtained by 192 steps or by a steam-lift; while the *Unterland* is a patch of shore with 70 houses south-east of the cliff. The resident population was (1860) 2172, and (1890) 2086; though in the bathing season Heligoland is visited by upwards of 12,000 summer visitors—attracted by the admirable bathing facilities offered, not by Heligoland itself, but by the 'Sandy Island,' or *Düne*, a small sandbank with scrubby vegetation, separated from the main island by a channel about a mile wide. Sandy Island was

formerly connected by land, but the inroads of the sea have gradually isolated it. The same agent, together with the heavy rainfall, the variations in the weather, and the disintegrating power of the frost, is still reducing the size of Heligoland itself. The western cliff has, according to Lindemann, receded 7 feet in the forty years preceding 1888. The soil on the flat top of the rock of



Heligoland.

Heligoland suffices for a little pasture-land, and for growing potatoes and cabbages. There are some sheep on the island, and a few cows. Wheelbarrows are the only wheeled vehicles. The spit of the Unterland gives partial shelter to two harbours, one to the north, the other to the south. The inhabitants are supported chiefly by the lobster and other fisheries, and by the summer visitors, pilotage having almost ceased, and the public gaming-tables, established in 1830, having been suppressed in 1871. There is practically no poverty, disease, or crime, and the people are very long lived. A lighthouse stands on the cliff near the village. The island, which was taken by the British from the Danes in 1807, and was formally ceded to England in 1814, was ceded to Germany, 1st July 1890, in return for concessions made to Britain in East Africa. Heligolandish, a dialect of North Frisian, is the native tongue, but German is currently spoken. Steamboats run to and from the North Frisian islands of Sylt and Föhr, and Hamburg.—Heligoland was anciently sacred to the goddess Hertha. According to tradition, the island was once vastly larger, great tracts of country having been swallowed up by the sea between 700 A.D. and the end of the 17th century. Christianity was first preached here by St Willibrod in the 7th century, after whose time the island received its present name of Holy Land. The inhabitants of Heligoland are divided into two classes, differing both in race and occupation—the one being fishers, the other tradespeople, small shopkeepers, &c. The first are Frisians, a tall and muscular race of hardy seamen, simple and primitive in their habits, and holding land-labour and soldiers in contempt. The merchant class consists of immigrants from Hamburg and other places on the mainland, or their descendants. There is a curious and picturesque church, on the roof of which is still the Dannebrog painted by the Danish authorities when the island belonged to Denmark. The people, though they had been very loyal to Great Britain, accepted without opposition the annexation to Germany; and after a visit from the Emperor, Heligoland was formally incorporated with the kingdom of Prussia and the province of Sleswick Holstein. See Black's *Heligoland* (1888); German books by Lindemann (1889) and Lipsius (1892); and H. Gätke, *Heligoland as an Ornithological Observatory* (trans. 1895).—Under the early kings of Norway (10th century onwards) the name *Hedgeland* was given to a district north of Throndhjem, extending from about 65° N. lat. to the neighbourhood of Svartisen glacier.

Heliocentric, in Astronomy, having the sun (Gr. *helios*) as centre of reference; the heliocentric place of a planet being opposed to its *geocentric* (Gr. *gē*, 'earth'), its place as seen from the earth.

Heliodorus, the earliest and best of the Greek romance writers, was born at Emesa, in Syria. He was a sophist of the second half of the 3d century A.D., but has sometimes been confounded with a bishop of Trikka, in Thessaly (*circa* 390). The work by which he is known is entitled *Æthiopica*, in ten books, narrating in poetic prose, at times with almost epic beauty and simplicity, the loves of Theagenes and Chariclea. The work is distinguished from the later Greek romances by its vigour and its pure morality. See Rohde, *Der Griechische Roman* (1876). There are editions by Bekker (1855) and Hirschig in *Scriptores Erotici* (1856).

Heliogabalus, or ELAGABALUS, emperor of Rome, was born at Emesa in 204 A.D. His real name was Varius Avitus Bassianus, but having, when a mere child, been appointed high priest of the Syro-Phœnician sun-god Elagabal, he assumed the name of that deity. Soon after the death of his cousin Caracalla, Heliogabalus was proclaimed emperor by the soldiers, in opposition to the legitimate sovereign, Macrinus, who had become obnoxious to the troops from his parsimony and the severity of his discipline. The rivals met in battle on the borders of Syria and Phœnicia in 218 A.D. Macrinus was defeated, and Heliogabalus, proceeding to Rome, quietly assumed the purple. His reign, which lasted rather more than three years and nine months, was infamous for the gluttony and the nearly unparalleled debaucheries of every kind in which he indulged. He was murdered in an insurrection of the prætorians in 222 A.D., and was succeeded by his cousin and adopted son, Alexander Severus.

Heliography, a method of communicating swiftly between distant points by means of the sun's rays reflected from mirrors. Either successive flashes or obscurations of a continuous reflection of the sun's light may be combined so as to read like Morse's telegraphic system (see TELEGRAPH). Heliography may be used for geodetic measurement, or for military and other signalling. The instruments which contain the mirrors are variously called *heliograph* and *heliostat*. The instruments have been so perfectly contrived as to be available at a distance of over 190 miles (in California); French engineers in Algeria have found the signals serviceable at a distance of 170 miles. As early as the 11th century A.D. Algeria possessed a system of heliographs: 'At the summit of this tower was an apparatus of mirrors, corresponding to similar ones established in different directions, by aid of which one could communicate rapidly with all the towns from one end of the empire to the other' (*Athenæum*, 28th January 1882). Recently there has been a great development in heliography, or sun-telegraphy, for signalling messages between the sections of an army in the

field, as during the British campaign in Afghanistan in 1880. Drummond's and Begbie's heliostats, and the heliographs (differing in details) of Mance and Anderson, are favourably known. The name heliostat was originally used of an Equatorial (q.v.) revolving on its polar axis.—*Heliotrope* was the name given to a mirror placed at the distant station, and adjusted by clockwork, so that at a particular hour of the day (arranged beforehand) the light of the sun shall be reflected from the mirror directly to the surveyor's station. See SIGNALLING.

Heliogravure. See PHOTOGRAVURE.

Heliometer ('sun-measurer') is an instrument invented by Savery and Bouguer in 1743–48, by means of which the diameters of the heavenly bodies can be measured with great accuracy. As improved by Dollond, the object-lens of the instrument is in two halves, each of which will form a perfect image in the focus of the eyepiece; and the images may be made to diverge, coincide, or overlap each other, by varying the distance between the half-lenses. If the diameter of the sun is to be measured, the two lenses are adjusted so that the images may touch each other; then the distance between the centres of the two object-glasses measured in seconds gives the diameter of the sun. Fraunhofer made many remarkable improvements on the heliometer.

Heliopolis ('city of the sun'), the Greek name of the city called by the Egyptians On, An, stood on the east side of the Pelusiac branch of the Nile, near the apex of the Delta, and was one of the most ancient and important of Egyptian cities. It was the chief seat of the wisdom of the Egyptians, and Thales, Plato, and Solon are reported to have learnt from its priests. Manetho, the historiographer of Egypt, was chief-priest here, an office filled centuries earlier by the father-in-law of the Hebrew Joseph. One of the red granite obelisks long famous as Pharaoh's Needles is still standing near the hamlet of Matareieh, 8 miles N. of Cairo. It is 70 feet high, and bears the name of Usurtesen I., the second king of the twelfth dynasty. The obelisk called 'Cleopatra's needle,' brought in 1878 to England, and that taken to New York in 1880, were originally brought to Alexandria from this city. For the Syrian Heliopolis, see BAALBEK.

Helios, the Greek name of the sun (the Roman *Sol*), who was worshipped as a god. According to Homer, he was a son of the Titan Hyperion and of Theia, and a brother of Selene or Eos. He is described by the same poet as giving light both to gods and men. He rises in the east, from the marshy borders of Oceanus, into whose dark abysses he also sinks at evening. The later poets, however, gave him a splendid palace in the east, somewhere below Colchis, and describe him as being conveyed, after the termination of the burning labours of the day, in a winged boat of gold, along the northern coasts of the sea back to Colchis. After the time of Æschylus, he began to be identified with Apollo or Phœbus, but the identification was never complete. His worship was widely spread. He had temples in Corinth, Argos, Trœzene, Elis, and many other cities, but his principal seat was Rhodes, where a four-team was annually sacrificed to him. The island of Trinacria (Sicily) was also sacred to Helios, and here his daughters, Phœtusa and Lampetia, kept his flocks of sheep and oxen. It was customary to offer up white lambs or boars on his altars. The animals sacred to him were horses, wolves, cocks, and eagles.

Helioscope, a telescope for observing the sun without injury to the eyes, by means of blackened glass or mirrors that reflect only a part of the light.

Heliotrope (*Heliotropium*), a genus of plants of the natural order Boragineæ (q.v.); of the section, sometimes made a distinct order, Ehretiaceæ, the fruit separating only when ripe into four carpels. Many of the species have fragrant flowers. The Peruvian Heliotrope (*H. Peruvianum*), a shrub with oblong-lanceolate wrinkled

Common Heliotrope (*Heliotropium Europæum*).

leaves and small lilac-blue flowers, is in almost universal cultivation for its fragrance, which resembles that of vanilla or cherry-pie. Many seminal varieties of this species are cultivated in gardens. They delight in rich light soil, and are propagated by cuttings of the young growing shoots in a moist warm atmosphere. The European or Common Heliotrope (*H. Europæum*), a native of the south and west of Europe, is an annual with small white, or rarely pale red, flowers. Large quantities of the flowers are used by perfumers for making scents.—Classical fable accounts for the name heliotrope (Gr. *hēlios*, 'the sun,' and *trepō*, 'I turn') by representing Clytia as turned into this flower through gazing at Apollo.

Heliotrope, or BLOODSTONE, a variety of chalcedony or of jasper, of a green colour with red spots. The finest heliotropes consist of chalcedony, and are translucent, at least at the edges; the jasper bloodstones are opaque. Heliotrope is found in many parts of the world, as in Scotland, but the finest specimens of this mineral are brought from the southern parts of Asia. It was well known to the ancients, who obtained it chiefly from Ethiopia and Cyprus. It is much used for boxes, seals, &c.; and those specimens are most valued which possess most translucency, and in which the red spots are bright and well distributed. It was much used in the early ages of the Christian church for the engraving of sacred subjects, the figures being so managed that the red spots should represent drops of blood. The name heliotrope (Gr. *hēlios*, 'the sun;' *tropē*, 'a turning') seems to have been given to this mineral because when immersed in water in the face of the sun it was said to make the image of that luminary in it appear of a blood-red colour. The heliotrope, thus described by Pliny, must have shown very large spots or veins of red.

Heliotrope, an instrument. See HELIOGRAPHY.

Heliotropism ('turning towards the sun'). When a seedling plant is placed in a transparent vessel of water within reach of the light of a window, the stem and leaves gradually bend towards, and the

roots from the light. The former phenomenon is termed *positive*, and the latter *negative*, heliotropism. The shoots and leaves of nearly all plants turn towards the light, and the turning of the sunflower towards the sun is familiar to every one. In the case of organs which are positively heliotropic the growth of the side next the light is retarded, and that of the opposite side increased; the result of these combined actions is a concavity on the former, and a convexity on the latter, thus causing a curvature towards the light. In the case of roots these actions are reversed. That these results are brought about by the action of light is evident; the cells on the concave side become less, while those on the convex side become more, turgid, thus forcing the organ to bend; but the cause of turgescence is unknown.

Heliotype. See PHOTOGRAPHY.

Heliozoa, or 'sun animalcules,' a class of Protozoa of the Rhizopod type—i.e. provided with protruding processes of living matter. These processes are unlike those of the Amœbæ (q.v.) in being slender and radiant, unlike those of Foraminifera (q.v.) in being stable and rarely interlaced. The unit-mass or cell of which the Heliozoon consists is globular and stable, with one nucleus or with many, and usually with vacuoles both contractile and non-contractile. There is generally a 'skeleton,' gelatinous or siliceous, and in the latter case either continuous or composed of loose spicules. Multiplication is effected by division of the cell into two, or by budding, or by that internal fission known as spore-formation. In some cases the spores or young Heliozoa are flagellate, and thus very unlike the comparatively slow and passive adults. In a few instances Heliozoa have been seen united in colonies. The majority live in fresh water, but some are marine. Common examples are Actinosphærium, Actinophrys, Raphidiophrys, and Clathrulina. See PROTOZOA; Butschli's Protozoa in Bronn's *Thierreich*.

Helium. See ARGON, SUN.

Helix (Gr., 'a snail'), a term used for a genus of molluscs, including the land-snails; for part of the human ear (see EAR); and for a small volute or twist in the capital of a Corinthian column.

Hell, the place of torment, and the condition to which the finally impenitent are consigned after death, located by all the Fathers in the centre of the earth, although St Thomas says no one, without a special revelation on the point, can say where it is. Unfortunately for clearness of ideas on the subject the word has been from the beginning employed in the most various senses, and the confusion has been only deepened by the fact that in our Authorised Version it has been employed to render three wholly different words, Sheol or Hades, Gehenna, and once Tartarus (2 Peter, ii. 4). The word Sheol occurs in the Old Testament sixty-five times, and is rendered 'hell' thirty-one times, 'grave' thirty-one times, and 'pit' three times. Its original meaning seems strictly to have implied merely the shadowy under-world, a deep and gloomy cavern considered as the abode of the souls of the dead, the common receptacle for all mankind, not yet definitely differentiated into two distinct classes with the more rigorous logic of a later age and a fuller revelation. The Hebrew conception of Sheol was merely a kind of vague shadow of past life, in which the soul was shut off from any communion with the living, although we see in its loftier expressions of religious aspiration the impassioned desire for an unbroken continuity of union with God rising into a vision so vivid that it almost realises itself (Job, xiv. 13–15; cf. also Ps. xvi. 10, xlix. 15, lxxiii. 24). In these passages the Psalmists, in the heights of spiritual elevation and consciousness of living communion with God, leap in vision across the separating grave into a real conviction of living continuity of fellowship that rises into the region of true immortality; Job, in the perplexity of despair between his present calamities and the immediate expectation of death before God's favour is renewed to him, yet absorbed with the idea that God cannot belie himself by finally forgetting his righteous servant and his former fellowship, grasps the notion of immortality as a necessity of God's inherent righteousness, and thus reaches the loftiest spiritual conception of Christianity—a living union possible between man and God, by a process of pure religious abstraction.

The hope of a future life, in Old Testament prophecy, hardly extended beyond the perfected glory of the Israelitic theocracy under conditions which were essentially earthly, but yet already partly elevated into the supernatural. The condition of the dead continued to be represented as a shadowy existence in Sheol—an existence without special religious significance and value.

In post-exilic Judaism, on the contrary, the faith in the *resurrection* of the pious dead (in connection with the Messianic time of salvation) developed itself out of these two elements: (*a*) from the more individual conception of the covenant-relation and from the postulate of retribution in the kingdom of the Messiah, and (*b*) from the influences of the Persian faith in the resurrection, which co-operated with the former and furnished to them a definite form. While this faith, through the *Pharisees*, became a popular element of the Messianic hope, the *Sadducees* held fast to the old Hebrew conception of Sheol, and the *Essenes* assumed the Hellenistic doctrine of the incorporeal immortality of souls in a higher state of being, a doctrine which fitted in with the Essene spiritualism.

In consequence of this developed eschatology, there then entered also into the conception of Sheol the distinction of different moral retributive states: (*a*) for the righteous in *Paradise* or Abraham's bosom; (*b*) for the godless in *Gehenna*.

The Septuagint equivalent for Sheol is *Hades*, a word which occurs in the New Testament eleven times, and in ten of these is rendered 'hell,' the sole exception being 1 Cor. xv. 55. Again, 'hell' is used as the rendering for Gehenna twelve times. Originally as in the Old Testament usage the latter word simply signified the Valley of Hinnom near the city, which had been defiled by the abominations of human sacrifice in the Moloch worship of Ahaz and Manasseh. It became later a kind of receptacle for filth, the combustible portions of which, according to some authorities, were consumed with fire. Hence in later times it became an image of the place of punishment, 'where their worm dieth not, and the fire is not quenched.' The word Tophet occurs in the Old Testament nine times, and apparently meant originally a grove or garden in Hinnom; afterwards defiled and polluted by idolatries, it became to the Rabbis a fit symbol for all abominations, the very gate or pit of hell. Almost all the passages in which the term Gehenna occurs are hopelessly metaphorical in character, on which it seems unsafe to build too rigorous dogmatic definitions: in such investigations should never be forgotten the saving caution, 'Theologia parabolica non est demonstrativa.' No less difficult is the Greek word *aiônios* (*aiôn*, Hebrew *olam*), variously rendered by 'everlasting' and 'eternal.' It occurs seventy-one times in the New Testament, and in some of these cases it is certainly employed of periods limited in duration. The word *aiôn* does not necessarily connote what is understood by 'eternity' either in classical or Hellenistic Greek, and in the Oxford Library of the Fathers we find its adjective rendered very properly by 'secular.'

So that St Augustine's famous argument (*De Civ. Dei*, xxi. 23), besides its unworthiness, is strictly a *non sequitur*—that because *aiōnios zoē* is assumed to mean 'endless life,' therefore *aiōnios kolasis* must mean 'endless punishment.' As Haupt says, 'eternal life' is not to St John a mere term for unbroken continuance in being, as though it were simply equivalent to the indissoluble life (*zoē akatalutos*) of Heb. v. 6; it does not define the form of this life so much as the nature and meaning of it; *zoē aiōnios* is, in other words, a description of divine life, of the life which is in God, and which by God is communicated. At the same time the plain exegesis of the greater number of relevant passages in the New Testament points rather to *everlasting* than to merely *œonian* rewards and punishments, and indeed it is difficult to resist the conviction that such phrases as the *olethros aiōnios* ('destruction') of 1 Thess. v. 3, and 2 Thess. i. 9, and the *telos* of Philippians, iii. 19, refer to endless, hopeless, irremediable doom.

The same uncertainty is reproduced in the Authorised Version in the words used to express the fact of judgment passed upon the souls of men. The words *krino*, *krisis*, and *krima* occur in the New Testament some 190 times; the words *katakrinō*, *katakrisis*, *katakrima*, 24 times. In all but fifteen places these words are properly enough rendered by 'judge' and 'condemn,' and their derivatives; in the rest 'damn' and 'damnation' have been employed, sometimes as incongruously as in 1 Cor. xi. 29; 1 Tim. v. 12; and Rom. xiv. 23.

Enough has been said to show the difficulties in the exegesis of the passages on which the dogmas of the church about the future punishment of the impenitent are based, and it only remains to state here the chief views of eschatology now prevalent, and to sketch briefly the development of these in the history of dogma. It does not belong to us to discuss the abstract theory of future retribution—a postulate of all religions whether rudimentary or advanced—nor to attempt to justify anew the ways of God to man by distinguishing *ex cathedra* what is of faith and what is mere human speculation.

I. The orthodox theory, both in the Eastern and Western churches, is that at death there is passed upon every impenitent sinner an irreversible sentence to torture of both his moral and physical nature, endless in duration, and inconceivably dreadful in intensity, yet proportioned in degree to the depths of the iniquity of the individual, whose sufferings include within them both the 'pain of loss' and the 'pain of sense.' The former implies the remorseful consciousness of the loss of all good; the latter embraces all forms of physical torment, as by material fire, utter abandonment and alienation from God, and the perpetual society of lost men and devils. The pains of hell for ever without any mitigation or hope of escape are the fate of all whose faith during their life on earth has not come up to the minimum required by the rigorous justice of God. Such has been the orthodox belief of almost the entire Christian church until now, and its fathers and theologians, from St Augustine and St Thomas Aquinas down to Jeremy Taylor, Thomas Boston, and Jonathan Edwards, have lavished all the wealth of impassioned rhetoric upon the description of its horrors. Medieval painters like Orcagna devoted all the riches of a grotesque imagination to the portrayal of its material torments infinite in variety as well as awful in intensity, and the famous fresco in the Campo Santo at Pisa shows what a really great artist could make of such a theme. Indeed, the words which Dante saw in his vision above the gloomy portals of hell, 'All hope abandon ye who enter here,' merely describe with literal truth the traditional belief of the Christian church. St Augustine even found himself, in accordance with his views of predestination, compelled to postulate the eternal damnation of unbaptised infants. Although he is disposed to look upon this condemnation as *mitissima* and *tolerabilior*, he opposed the doctrine condemned by the synod of Carthage (419 A.D.) of an intermediate state in which unbaptised infants were said to be (*Limbus infantum*). Dante sees these hapless victims of fate in the first circle of the *Inferno*, and indeed this belief was held by the entire medieval church; while the eternal damnation of non-elect infants still stands implied in the famous Confession of Faith of the Westminster Divines. St Thomas Aquinas supposes that the bliss of the saved will be heightened by their witnessing the punishment of the wicked; and Jonathan Edwards thus expresses the same monstrous notion, 'the view of the misery of the damned will double the ardour of the love and gratitude of the saints in heaven.' To the Catholic the horrors of hell are enormously mitigated by the notion of an intermediate state of punitive probation, in which the souls of such as have not died in mortal sin are purged from the guilt of earthly sin, and made fit for translation to heaven to the companionship of God and his elect saints. See PURGATORY.

II. The second belief in importance is that associated with the great name of Origen, and variously termed Universalism, Restoration, or the Larger Hope—viz. that all men ultimately will be saved. Origen believed that the punishment of hell itself was but purgatorial in its character, that, its purifying effect once attained, the punishment would cease for all, most probably even for the devils themselves, and that the duration in each case would be proportioned to the guilt of the individual. This doctrine of the final restoration of all to the enjoyment of happiness is the theory of the *Apocatastasis* to which so many of the early Christian writers allude. It was taught definitely by Gregory of Nyssa, who foretells in glowing words a time when 'there shall no longer be a sinner in the universe, and the war between good and evil shall be ended, and the nature of evil shall pass into nothingness, and the divine and unmingled goodness shall embrace all intelligent existence.' Theodore of Mopsuestia teaches that in the world to come 'those who have done evil all their life long will be made worthy of the sweetness of the divine bounty. For never would Christ have said "until thou hast paid the uttermost farthing" unless it were possible for us to be cleansed when we have paid the penalty. Nor would he have spoken of the many stripes and few unless after men had borne the punishment of their sins they might afterwards hope for pardon.' Gregory of Nazianzus seems to have held the same opinion; and St Jerome, who does not accept it, at least treats it with respect, and adds 'human frailty cannot know the judgment of God, nor venture to form an opinion of the greatness and the measure of his punishment.' The Reformers followed Augustine except in so far as they rejected Purgatory, first taught distinctly in his treatise *De Doctrina Christiana*. Of theologians inclined to the wider hope it is enough to name Bengel, Henry More, Rothe, Neander, Tholuck, and Martensen; and among ourselves Maurice, Milman, Kingsley, Alford, Erskine of Linlathen, Thirlwall, Plumptre, and Farrar. The last has argued for the cause with equal learning and eloquence.

In close connection with the theory of universalism, as suggesting inferences all tending to the possibility of purification and educational discipline being mingled with the penalty for sin beyond the grave, is the much-debated question of the descent of Christ into hell to preach to the spirits

in prison. The earliest account of this as a historical fact is given by Eusebius, but it soon appears with fantastic elaboration in the apocryphal gospel of Nicodemus, and a statement of belief in it was inserted in the Apostles' Creed, in the earlier forms of which, however, it does not appear, any more than it does in the creeds of Irenæus, Origen, Tertullian, Cyprian, nor in that of the Council of Nice. Yet we find it distinctly taught by Ignatius, Hermas, Justin Martyr, Irenæus, Tertullian, Clement of Alexandria, Origen, Cyprian, Cyril, Ambrose, Jerome, Augustine, and Chrysostom. It was maintained in answer to Arian and Apollinarian heresies, as proving the true humanity and the real death of Christ. Besides 1 Peter, iii. 19, the other passages in Scripture considered to support this belief are Eph. iv. 9, and Acts, ii. 27–31. Tertullian asserts that heaven is not open till the end of the world, and that all men are in Hades, either comforted or tormented, and that the purpose of our Lord's descent was that the patriarchs should be made partakers of him. The belief soon came to be widely held that the patriarchs and prophets were in Hades, but passed with Christ into Paradise—the germ of the medieval doctrine of the *Limbus patrum*. Augustine seems to have believed that Christ's preaching was effective in saving some souls which were in torment. Cyril of Alexandria describes Christ as having by his descent 'spoiled Hades utterly, and thrown open to the spirits of those that slept the gates that none may escape from, and leaving the devil there in his solitude and desolation, having risen again.' To him it was the supremest proof of Christ's love to man that the Cross, the symbol of deliverance, had been raised in Hades itself. The theme early became a subject of Christian art, as the 'Harrowing of Hell' was a favourite subject of our own medieval writers of mysteries, and takes its place in the great *Divina Commedia* of Dante. The Reformers felt that the doctrine lent support to the dogma of Purgatory, and some, as Calvin, taught that the descent into Hades meant only the terrible anguish with which the soul of Christ was tried, equalling in its intensity for the time the sufferings of the damned, while others merely admitted the fact without allowing themselves to define anything as to its purpose or result. Hammond, Pearson, and Barrow maintain the only meaning of St Peter's words to be that our Lord by his Holy Spirit, inspiring Noah, preached to the disobedient antediluvians, who are now for their disobedience imprisoned in hell—an explanation that had already occurred to Jerome and Augustine. Bishop Harold Browne observes that on this subject Pearson has written less logically than is his wont, and says well that the real difficulty consists in the fact that the proclamation of the finishing of the great work of salvation is represented by St Peter as having been addressed to these antediluvian penitents, while no mention is made of the penitents of later ages, who are equally interested in the tidings. It can hardly be denied that the patristic interpretation is most in harmony with an honest exegesis of the passage in St Peter's epistle, but here it may be enough to summarise the opinions of two great Protestant theologians, Martensen and Dorner.

The former says that departed souls live a deep spiritual life, for the kingdom of the dead is a kingdom of subjectivity, of *remembrance* in the full sense of the word. At death the soul finds itself in a world of pure realities; the manifold voices of the world, which during this earthly life sounded together with the voices of eternity, grow dumb, and the holy voice now sounds alone, no longer deadened by the tumult of the world; and hence the realm of the dead becomes a realm of judgment. Departed spirits thus not only live and move in the elements of bliss or woe which they have formed and prepared for themselves in time, but they continue to receive and work out a new state of consciousness, because they continue spiritually to mould and govern themselves in relation to the *new* manifestation of the divine will now first presented to their view.

Of the famous passage of St Peter, Dorner says that Peter really contemplates Christ after his death, probably before his resurrection, as active in the region of the dead, and therefore not in the place of torment, but in the intermediate region. There is an Intermediate state before the decision of the Judgment. The Reformation, occupied chiefly with opposition to the Romish Purgatory, leaped over, as it were, the middle state—i.e. left at rest the questions presenting themselves here, gazing with unblenched eye only at the antithesis between the saved and the damned, on the supposition (retained without inquiry), in opposition to more ancient tradition, that every one's eternal lot is definitely decided with his departure from this present life. This is in keeping with the high estimation put on the moral worth of the earthly life. Nevertheless, the view is untenable, and that even on moral grounds. Not merely would nothing of essential importance remain for the Judgment if every one entered the place of his eternal destiny directly after death, but in that case also no space would be left for progressive growth of believers, who yet are not sinless at the moment of death. If they are conceived as holy directly after death, sanctification would be effected by separation from the body; the seat, therefore, of evil must be found in the body, and sanctification would be realised through a mere suffering of death as a physical process instead of through the will. Add to this that the absoluteness of Christianity demands that no one be judged before Christianity has been made accessible and brought home to him. But this is not the case in this life with millions of human beings, as the heathen in central Africa. Nay, even within the church there are periods and circles where the gospel does not really approach men as that which it is. Moreover, those dying in childhood have not been able to decide personally for Christianity. The passages which make the pious enter at once a better place exclude a Purgatory as a place of punishment or penance, but by no means exclude a growth in perfection and blessedness. Even the departed righteous are not quite perfect before the resurrection. Their souls must still long for the dominion of Christ and the consummation of God's kingdom. There is, therefore, a *status intermedius* even for believers, not an instantaneous passage into perfect blessedness.

How closely this touches the question of the admissibility of Prayers for the Dead will be at once apparent, although that subject hardly falls to be discussed here. It was an ancient pre-Christian custom to offer up prayers for the dead, and we early find traces of it in the Christian Church. These St Augustine thought might at least secure for the lost a *tolerabilior damnatio*.

III. Another view, not without its adherents, is that of Conditional Immortality or Annihilationalism, according to which final destruction and not endless suffering is the doom of the finally impenitent. It of course traverses the belief in the inherent immortality of the soul, the instinctive hope and belief of all mankind everywhere; and, if it saves the mind from the horror of endless torment, necessitates the belief that God will raise up the impenitent from the dead only to be tormented and at last destroyed. Its adherents depend for proof on the literal and assumed interpretation of

a few passages of Scripture, and count among its modern supporters Watts, Isaac Taylor, and Whately.

The principal theories of future retribution having thus been briefly sketched, it only remains to say a few words more generally upon the significance of New Testament eschatology, and the mode of its development; and here we shall follow closely in the track of Pfleiderer. The whole of the Primitive-Christian community lived in the expectation of the speedy return of Christ and the advent of his visible kingdom of glory upon earth. Further, the *Apocalypse* of John (following the Jewish apocalyptic—e.g. the *Book of Enoch*) distinguished between (1) the earthly kingdom of Christ (of limited duration—1000 years, hence *Chiliasm*), beginning with the Parousia and First Resurrection, and (2) the definitive end of the world (Rev. xx. 2–7) following thereupon, which, through a second general resurrection and judgment of the world, together with the annihilation of the kingdom of Satan, will introduce the eternal completion of the kingdom of God: which completion, moreover, the Apocalypse also still represents in accordance with the analogy of the Israelitish theocracy—descent of the heavenly Jerusalem (Rev. xxi.).

In the Pauline eschatology two essentially different views cross each other: (*a*) On the one hand, the specifically Jewish-Christian expectation (handed down in the Christian community) of the following miraculous catastrophes: Parousia, Earthly Reign of Christ, Resurrection of Christians, General Judgment (1 Cor. xv. 23–26; 1 Thess. iv. 13–18)—under the assumption of which the state of souls between death and resurrection appears as a middle state, like sleep; on the other hand (*b*) a result of the specifically Pauline doctrine of the Spirit of Christ—viz. the expectation of a glorified state of individual Christians in fellowship with Christ—a state already prepared in the life of the Christian on this side the grave, and therefore beginning immediately after death to unfold its fullness in the manifestation of a body-of-light (Rom. viii. 10 *et seq.*, and 17–23; 1 Cor. v. 1 *et seq.*; Phil. iii. 20 *et seq.*). The latter mode of conception appeared first in the later Pauline epistles, without however being made to harmonise with the first. The definitive end of the world Paul conceives as introduced by the subjugation of all the enemies of God, which is carried out under the earthly rule of Christ as king (whether through their conversion or even through their complete annihilation), and finally of even death itself. On this follows the surrender of the kingdom by Christ to God and the dominion of God alone in all creation, even to outward nature—glorified and serving God in freedom (1 Cor. xv. 27 *et seq.*; Rom. viii. 21).

The ideal tendency of the Pauline eschatology was strengthened from the side of Hellenism, under whose influence already the Epistle to the Hebrews had combined the future Messianic world of Jewish-Christianity with the higher, heavenly, or ideal world, and had immediately attached the perfect state to the death of the individual (Heb. xii. 23; iv. 9 *et seq.*; ix. 27).

In John the idealising spiritualisation of the traditional eschatology goes still further by transforming the *external* perfection (in the future) into the *internal* perfecting of the religious Christian life of the present church. As already the 'coming again' of Christ, in the valedictory discourses, wavers between future Parousia and present Coming-in-the-Spirit (John, xiv. 16), so also the 'eternal life' of believers has now already become realised in the present in their corporate unity with God and Christ, which is above death and judgment, and which receives no essential addition even through the future resurrection to life (which, withal, is here firmly adhered to). In like manner, also, Judgment realises itself already in the historical life of the community, continuously, in the process of separation betwixt faith and unbelief, sonship to God and to the Devil—which separation will find only its full outward manifestation in the future two-sided resurrection (John, xvii. 3; xi. 25 *et seq.*; vi. 40; v. 24 *et seq.*; iii. 17–21, 36; xvi. 8 *et seq.*).

In the spiritualisation of eschatology Origen only went further on the line pursued by the Gospel of John. The other Church Fathers in opposition to Gnostic spiritualism laid stress all the more decisively on the sensuous reality of the last things, even to the Pharisaic fleshly identity of the resurrection body with the earthly one. Only it must be noted that Chiliasm, as an apocalyptic hope for the future, was from the 3d century all the more decisively rejected by the church, the more its idea realised itself in the church's own dominion over the world, and the Parousia of Christ was pushed forward from the near future to the far-off distance.

The conception of the *Ignis Purgatorius*, derived from the Platonic doctrine of the purifying penances of souls in the world beyond the grave, was early adopted by individuals, but from the time of Gregory I. became a part of the Catholic Church's faith, closely connected with the Mass and with the church's penitential discipline, for which reasons it was rejected by Protestant orthodoxy, which makes the unchangeable and endless retributive states of salvation and damnation ensue immediately on the death of the individual, between which states there is no third, though different degrees within both are admitted. In no other respect does the Protestant eschatology differ from the Catholic. Chiliasm is rejected as a Jewish error; but the Parousia of Christ with general resurrection, judgment, and transformation of the world stands as the solemn close of time and entrance on eternity. In the further course of Protestant theology some more mystical thinkers have sought to vivify the abstract monotony of the world beyond the grave as conceived by the church (*a*) by adopting once more the biblical Chiliasm, now termed Millenarianism, or (*b*) by finding a compensation for purgatory in assuming the capability of conversion beyond the grave, or assuming a growing perfectibility, or assuming a general restoration of all men (*Apocatastasis*).

On the contrary the more rational theologians tended rather to set aside the last remains of the primitive Christian dogmas—Parousia and Resurrection, and to reduce this whole section of doctrine to the Alexandrine form of the incorporeal continuance of souls. Philosophic thinkers found the essential idea of Christian eschatology in the immanent eternity or infinity of the religious spirit; along with which the individual continuance of souls was denied by some (as in Schleiermacher's *Reden*; it is otherwise in his *Glaubenslehre*; and by the Hegelian Left), but asserted by others (as by Leibnitz, Wolff, Kant, Fichte, Schelling, the Hegelian Right, Krause, Herbart, Lotze, Teichmüller, &c.).

Theology holds almost exclusively to the latter side. The Christian faith has from the beginning combined the two fundamental forms of hope for the future: (*a*) the Hebrew, of hope for the *earthly* future perfection of the people of God, and (*b*) the Hellenistic, directed to the *supra-mundane* perfection of the individual soul. Each of the two represents an essential side of the Christian hope, and is conceivable without self-contradiction; it is only from the mixture of both sides, as it passed over from the Jewish theology into primitive Christianity, that obscurities and contradictions

arose. To set aside these and bring each of the two sides, the mundane and the supramundane, or the social and individual, hope of perfection to the clearest possible view appears to be the eschatological task of the theology of the present.

The primitive Christian faith in the return of Christ and the earthly erection of his kingdom includes the ideal of the earthly realisation of the kingdom of God, or of the extensive and intensive permeation of the Christian spirit throughout humanity, as the goal and task of the history of the world. It is in the union of all mankind in the family of the children of God and in the moralising of the whole life of society through the power of the Christian spirit that the victorious Coming and Royal Rule of Christ in the earthly world is constantly realising itself. But, because realising itself upon the foundation of the historical life of nations, it remains constantly bound to those conditions and limits which are historically human.

Christian faith hopes to find in the supramundane or heavenly future of the individual persons the completion of what is on earth but fragmentary, and the harmony of what is on earth discordant. This hope rests partly (*a*) on the consciousness of the independent super-sensuous reality of the personal life distinct from its sensuous organism; partly and especially (*b*) on the conviction of our faith that we are destined to perfect likeness to God and fellowship with God, and that this our destination is eternally founded in God, and therefore not to be set aside by any temporal contingency whatever.

Since the capacity for development which is inherent in the nature of the human soul cannot be removed with the death of the body, and since the eternity of the pains of hell may be considered neither psychologically thinkable nor consistent with the all-wise love of God, nor yet correspondent to the thought of 1 Cor. xv. 28, therefore the Protestant doctrine of the stability of the twofold state of departed souls must be transformed into the thought of an infinite variety of forms and stages of development beyond the grave in which there remains room for the infinite love to exercise endlessly its educative wisdom. Further, the unbiblical conception of a resurrection of the body of flesh is to be explained according to the spiritualised (1 Cor. xv. 44, also 50th verse) Pauline theory of resurrection bodies, in doing which the speculative theory of the body as the totality of ministering forces organised by the soul itself may be called to our aid.

For the rest, the true evangelical treatment of the 'last things' must follow the principle of biblical caution; and, instead of arbitrarily picturing to ourselves that which is unsearchable, we can content ourselves with the promise that we will be present with the Lord, and that the eternal blessed life, which is begun indeed already here below, but, under the endless suffering of the world, remains constantly incomplete, will at last reach perfection in the knowledge and love of God.

See the articles Conditional Immortality, Devil, Heaven, Immortality, Mohammed, Prayer, Purgatory, Resurrection; also the Histories of Dogma of Neander and Hagenbach; E. White's *Life in Christ* (1846); Andrew Jukes's *Restitution of All Things* (2d ed. 1869); J. Baldwin Brown's *Doctrine of Annihilation in the Light of the Gospel of Love* (1875); F. N. Oxenham's *Catholic Eschatology and Universalism* (2d ed. 1878), and his answer to Pusey, *What is the Truth as to Everlasting Punishment* (2 parts, 1882); H. M. Luckock's *After Death* (1879); W. R. Alger's *Critical History of the Doctrine of a Future Life* (10th ed., with a complete bibliography of the subject, comprising 1977 books relating to the Nature, Origin, and Destiny of the Soul, by Ezra Abbot, Boston, 1880); E. H. Plumptre's article 'Eschatology' in Smith and Wace's *Dictionary of Christian Biography, &c.* (vol. ii. 1880), and his *Spirits in Prison, and other Studies on the Life after Death* (1885); F. W. Farrar's *Eternal Hope* (1878), and *Mercy and Judgment* (1881); S. Davidson's *Doctrine of Last Things contained in the New Testament* (1882); Th. Kliefoth's *Christl. Eschatologie* (Leip. 1886); and Professor J. Agar Beet's series of papers in the *Expositor* for 1890.

Hellas. See Greece.

Hellebore, a name applied to two distinct genera of plants. The genus to which it more properly belongs, and to which it has belonged since very ancient times, Helleborus, is of the natural order Ranunculaceæ, and is characterised by a calyx of five persistent sepals, often resembling petals; a corolla of eight or ten very short, tubular, honey-secreting petals; numerous stamens and three to ten pistils; a leathery capsule, and seeds arranged in two rows. The species are perennial herbaceous plants, mostly European, generally with a short root-stock; the stem mostly leafless, or nearly so, but sometimes very leafy; the leaves more or less evergreen, lobed, the flowers terminal. A familiar example of this genus is the Black Hellebore—so called from the colour of its roots—or Christmas Rose (*H. niger*), a favourite in flower-gardens, because its large white flowers—which have in recent years been greatly improved by florists in point of size and purity of colour—are produced in winter. The leaves are all radical; the stalks generally one-flowered; the flowers white or tinged with red. Black hellebore formerly enjoyed a higher reputation as a medicinal agent than it now possesses. Melampus is represented as employing it in the treatment of madness centuries before the Christian era. The root is the part used in medicine, and it is imported into

Christmas Rose (*Helleborus niger*).

Britain from Hamburg, and sometimes from Marseilles. It consists of two parts—the rhizome or root-stock, and the fibres descending from it. The former is nearly half an inch thick, several inches long, and knotty, with transverse ridges and slight longitudinal striæ. The taste is slight at first, then bitter and acrid. It is not much employed at the present day, but it has been found of service (1) in mania, melancholia, and epilepsy; (2) as an emmenagogue; (3) in dropsy—its action as a drastic purgative, and its stimulating effect on the vessels of the liver, rendering it useful; (4) in chronic skin diseases; and (5) as an anthelmintic. Ten or fifteen grains of the powdered root act as a sharp purgative. The

tincture, which is obtained by maceration in spirit, is usually given when its action as an emmenagogue is required. In an excessive dose it acts as a narcotic acrid poison, and causes vomiting, purging, burning pain in the stomach and intestines, faintness, paralysis, and death.—Stinking Hellebore (*H. fœtidus*) grows on hills and mountains in the south and west of Europe, in some of the chalk districts of England, and in several places in Scotland. It has a very disagreeable smell, and green flowers somewhat tinged with purple. The stem is many-flowered and leafy.—Green Hellebore (*H. viridis*), also found in the chalk districts of England, has a leafy stem, with a few large greenish-yellow flowers. The celebrated hellebore of the ancients was probably a species peculiar to Greece and the Levant, *H. orientalis* or *H. officinalis*; all the species, however, have similar medicinal qualities. From the abundance of the plant around the city of Anticyra, hypochondriacal persons were said to need a visit to Anticyra.

White Hellebore (*Veratrum album*) belongs to the natural order Melanthaceæ. The genus has polygamous flowers, with six-leaved perianth, six stamens, three pistils cohering at the base, a three-horned capsule separating into three many-seeded follicles, and compressed seeds winged at the apex. White hellebore has a leafy stem, sometimes 4 feet high, ovate-oblong leaves, a long terminal compound panicle, and yellowish-white flowers. It abounds in the mountains of the centre and south of Europe, but is not found in Britain. The root was once much used in medicine, but now rarely, although it seems to act powerfully in some diseases. It is a very acrid and active poison. Its powder is used to destroy lice, and by gardeners for killing caterpillars. A decoction and ointment of it are sometimes used in itch and ringworm. Caution is necessary even in handling the powder of white hellebore, and very unpleasant effects ensue from its getting into the eyes or nose.—American Hellebore, or Swamp Hellebore (*V. viride*), known also as Indian Poke or Itch Weed, is frequent in damp grounds from Canada to Carolina. Its root has properties similar to those of white hellebore. These properties seem to depend chiefly on an alkaloid called Veratria (q.v.).

Hellenist (Gr. *Hellēnistēs*), one who adopts Greek customs and language; a name given especially to those among the Jews, and afterwards in the Christian church of Judea, who, either by birth or by residence, and by the adoption of the Greek language, manners, and usages, were regarded as Greeks—in opposition to the Hebrews properly so called, whether of Palestine or of the Dispersion, and to the Hellenes, or Greeks proper. They are called *Grecians* in the Authorised Version, *Grecian Jews* in the Revised Version, of the New Testament. They inevitably stood in a relation of rivalry, if not of antagonism to the Hebrews (see Acts, vi. 1, and ix. 29). It was among the Jews settled in Alexandria that the Hellenising tendency found its freest development; and it is to that city that we must refer the formation as well of that peculiar dialect of the Greek language which is known as the Hellenistic, as of that speculative philosophy which exercised so large an influence on those early Christian schools, of which Origen is the most famous exponent (see ALEXANDRIA).

The really characteristic element of the Hellenistic Greek consists in its foreign, and especially its Hebrew and Aramaic words and idioms. Although it was in its origin a purely popular form of the language, yet its being employed in the Alexandrian or Septuagint version of the Old Testament has given to it all the fixedness and definite character of a written language. The Hellenisms of the Septuagint differ in many respects from those of the New Testament, which again present some points of discrepancy with those of the Alexandrian Fathers; but there are certain leading characteristics common to them all.

The influence of the Hellenistic modes of thought on the Alexandrian philosophy will be traced under PHILO, NEOPLATONISM, PLOTINUS, &c.

See Winer, *Grammatik des N. T. Sprachidioms* (1822; 7th ed. 1867); Alex. Buttmann, *Gramm. des N. T. Sprachgebrauchs* (1859); S. A. Green, *Handbook to the Grammar of the Greek New Testament* (1885); W. H. Simcox, *On the Language of the New Testament* (1889); Dr Hatch, *Essays in Biblical Greek* (1889). There are dictionaries of New Testament Greek by Schleusner (1792), Robinson (Boston, 1836; New York, 1850), Cremer (1866; Eng. ed. by Urwick), D. Harting (2d ed. Utrecht, 1888); also Grimm's ed. of Wilke's *Clavis* (1868, and 1877–79; Eng. ed. by Professor Thayer). Concordances of the Greek New Testament are those by R. Young (1884), and Hastings and Hudson, as revised by E. Abbot (Boston, 1885).

Heller, STEPHEN, pianist and musical composer, was born on 15th May 1813 at Pesth, and made a brilliant début as a pianist when only nine years of age. Before he was sixteen he had played in most of the principal cities of Europe. From 1830, when he settled in Augsburg, he began to study composition. In 1838 he removed to Paris, where he occupied himself with composing and teaching until his death, on 13th January 1888. In the matter of technique he must be ranked beside Chopin. He wrote almost exclusively for the pianoforte; his works, which number about 150, consist of sonatas, études, &c., and are distinguished by originality and refinement. See his Life by Barbedette (Paris, 1876).

Hellespont. See DARDANELLES.

Hell Gate, or HURL GATE, named by the Dutch settlers of New York *Helle Gat*, is a pass in the East River, between New York city and Long Island, formerly very dangerous to vessels from its numerous rocks and rapid current. As early as 1851 attempts were made to blast away the obstructions; the operations which in 1885 finally freed the navigation are described, with an illustration, in the article BLASTING.

Hellin, a town of Spain, 69 miles by rail NNW. of Murcia. In the vicinity are productive sulphur-mines and sulphur-springs. Pop. 13,700.

Helm. See STEERING.

Helmet. See ARMOUR, HERALDRY.

Helmet-shell (*Cassis*), a genus of gasteropods, type of a family (Cassidæ), the members of which are somewhat whelk-like, and have thick, heavy shells, with bold ridges, a short spire and a long aperture, the outer lip toothed, the canal recurved. Numerous species, amounting to about fifty if we include closely allied genera such as Cassidaria, occur in the warmer seas. As the shells are made up of differently-coloured layers, they are much used for the manufacture of Cameos (q.v.). The species most used is the large Black Helmet (*C. madagascarensis*), sometimes almost a foot long, with a whitish outer and black inner layer.

Helmholtz, HERMANN VON, a very distinguished scientist, was born at Potsdam, 31st August 1821; he was ennobled by the Emperor of Germany in 1883. He was at first a surgeon in the army, then assistant in the Berlin Anatomical Museum, and was a professor of Physiology from 1849 at Konigsberg, from 1855 at Bonn, and from 1858 at Heidelberg. In 1871 he became professor of Physics in Berlin. Helmholtz is equally distinguished in physiology, in mathematics, and in experimental and mathematical

physics. His physiological works are principally connected with the eye, the ear, and the nervous system. Thus, we have his exhaustive treatise on Physiological Optics, his Specimen for the examination of the Retina, his Discourse on Human Vision, and various papers on the means of measuring small periods of time, and their application to find the rate of propagation of nerve-disturbances. Of a semi physical nature we have his Analysis of the Spectrum, his explanation of Vowel Sounds (*Klangfarbe der Vocalen*: see SOUND), and his papers on the Conservation of Energy with reference to Muscular Action. In physical science he is known by his paper on Conservation of Energy (*Ueber d. Erhaltung d. Kraft*, 1847, translated [badly] in Taylor's *Scientific Memoirs*, new series); by a popular lecture on the same subject (1854); by two memoirs in Crelle's *Journal*, on Vortex-motion in fluids, and on the Vibrations of Air in open pipes, &c., and by several researches into the development of electric current within a galvanic battery. His *Populare wissenschaftliche Vortrage* appeared in 1865 76 (Eng. trans. by Atkinson, with Introduction by Tyndall, 1881); his great work on *Die Lehre der Tonempfindungen* (Eng. trans. by Alex. J. Ellis, *The Sensations of Tone*) in 1862; his *Wissenschaftliche Abhandlungen* in 1881-83; and his *Reden und Vortrage* in 1884. He died 8th September 1894.

See Clerk-Maxwell in *Nature*, vol. xv.; Rücker in *Nature*, vol. li.; and Bezold's German monograph (1895).

Helminthology, that branch of Zoology which treats of worms, especially parasites.

Helmond, a town in the Netherlands, province of North Brabant, lies 23 miles NW. of Venlo by rail. There are manufactures of textiles, machinery, and iron. Pop. 9029.

Helmont, JEAN BAPTISTE VAN, Belgian chemist, was born at Brussels in 1577. At Louvain he studied medicine and its cognate sciences, but soon turned aside from them to throw himself into the movement known as mysticism, to study the works and practise the precepts of Thomas à Kempis and Johann Tauler. Then, falling in with the writings of Paracelsus, he came back to his first love, and began to study chemistry and natural philosophy. After spending several years in France, Switzerland, and England, in 1605 he returned to Amsterdam, married Margaret van Ranst, a noble lady of Brabant, and in 1609 settled down at his estate near Vilvorde, where he spent the remainder of his life in chemical investigations of various kinds. He died 30th December 1644. In spite of much theosophical mistiness and much alchemical error, Van Helmont is regarded by some historians of chemistry as the greatest chemist who preceded Lavoisier. He was the first to point out the imperative necessity for employing the balance in chemistry, and by its means showed, in many instances, the indestructibility of matter in chemical changes. He paid much attention to the study of gases, and is supposed to have been the first to apply the term *gases* to elastic aeriform fluids. Of these gases he distinguished several kinds. He was also the first to take the melting-point of ice and the boiling-point of water as standards for the measurement of temperature. It is in his works that the term *saturation* is first employed, to signify the combination of an acid with a base; and he was one of the earliest investigators of the chemistry of the fluids of the human body. Along with other physiologists of his day, he speculated much on the seat of the soul, which he placed in the stomach. An account of his contributions to the knowledge of chemistry will be found in the Histories of Chemistry by Kopp and Höfer. His works, entitled *Ortus Medicinæ*, were published by his son four years after his death, and frequently since then. See Rommelaere, *Études sur Van Helmont* (Brussels, 1868).

Helmstedt, a town of Germany, 24 miles by rail ESE. of Brunswick, was formerly famous for its Protestant university, founded by Julius, Duke of Brunswick, in 1574, and suppressed by Jerome Bonaparte in 1809. The university building (the Juleum), which still remains, the 12th-century church of St Stephen, and the Marienberg church are the most noteworthy edifices. Helmstedt grew up originally round the monastery (now in ruins) of St Ludger in the 9th century. Pop. 9800.

Helmund, or HELMAND, a river of Afghanistan, rises on the south slopes of the Hindu Kush, flows south-west, west, and north-west, and after a course of about 680 miles empties itself into the lake of Hamun or Seistan. See map at AFGHANISTAN.

Helobiæ, or MARSH LILIES, form one of the chief groups of Monocotyledons, and comprise the four orders Butomaceæ, Alismaceæ, Juncagineæ, and Hydrocharideæ.

Heloderm. See GILA MONSTER.

Héloïse. See ABELARD.

Helots were the lowest of the four classes into which the population of ancient Sparta was divided. They are generally supposed to have been the aboriginal population of the country, and to have been reduced to bondage by their Dorian conquerors, their numbers being swelled from time to time by the addition of peoples conquered in war. They belonged to the state, which alone had the power to set them at liberty; but they toiled for individual proprietors, and were bound to the soil—i.e. they could not be sold away from the place of their labour. They were the tillers of the land, for which they paid a rent to their masters; they served at the public meals, and were occupied on the public works. In war they fought as light troops, each freeborn Spartan (who bore heavy armour) being accompanied to battle by a number of them, sometimes as many as seven. On rare occasions they were equipped as heavy-armed soldiers. It is a matter of doubt whether after emancipation they could ever enjoy all the privileges of Spartan citizenship. They were treated with much severity by their masters, especially in the later ages of Sparta, and were subjected to degradation and indignities. They were whipped every year, to keep them in mind of their servile state; they were obliged to wear a distinctive dress (clothes of sheepskin and a cap of dog's-skin), and to intoxicate themselves as a warning to the Spartan youth; and when they multiplied to an alarming extent, they were often massacred with the most barbarous cruelty. On one occasion 2000 of them, who had behaved bravely in war, were encouraged to come forward for emancipation, and were then treacherously put to death. The Spartans organised, as often as necessity required, secret service companies (Gr. *crypteia*) of young men, who went abroad over the country armed with daggers, and both by night and day assassinated the Helots, selecting as their special victims the strongest and most vigorous of the race.

Helps, SIR ARTHUR, essayist and historian, was born at Streatham, Surrey, 10th July 1813. From Eton he passed to Trinity College, Cambridge, where he was thirty-first wrangler in 1835; but, what meant more, was admitted a member of the famous Society of the Apostles, among whom were Charles Buller, Maurice, Trench, Monckton Milnes, and Tennyson. On leaving the university he

became private secretary to Spring-Rice, then Chancellor of the Exchequer, and next to Lord Morpeth, the Irish secretary. On the fall of the Melbourne ministry he retired to enjoy twenty years of lettered leisure. In 1860 he was appointed Clerk to the Privy-council, and was in consequence much thrown into contact with the Queen, who, it is understood, set a high value upon his character and talents. He was employed to edit the *Principal Speeches and Addresses of the late Prince Consort* (1862), and the Queen's own *Leaves from a Journal of Our Life in the Highlands* (1868). He received the degree of D.C.L. from Oxford in 1864, was made C.B. in 1871, and K.C.B. in 1872. He died in London, after a few days' illness, 7th March 1875.

His first work was a series of aphorisms entitled *Thoughts in the Cloister and the Crowd*, published as early as 1835. The next, a work of more real consequence, was *Essays written in the Intervals of Business* (1841). Two worthless plays followed, then *The Claims of Labour* (1844), and *Friends in Council* (two series, 1847–59), an admirable series of discussions on social questions, thrown into a conversational form. The same familiar speakers (Milverton, Ellesmere, and Dunsford) reappeared in *Realmah* (1869), *Conversations on War and General Culture* (1871), and *Talk about Animals and their Masters* (1873). His strong interest in the question of slavery prompted his *Conquerors of the New World and their Bondsmen* (1848-52), and the greater work, *The Spanish Conquest in America* (4 vols. 1855-61). Out of his studies for this work grew his admirable biographies of *Las Casas* (1868), *Columbus* (1869), *Pizarro* (1869), and *Cortes* (1871). Other works are *Companions of my Solitude* (1850), *Casimir Maremma* (1870), *Brevia* (1871), *Thoughts upon Government* (1872), *Life and Labours of Thomas Brassey* (1872), and *Social Pressure* (1875).

Helps is one of the most suggestive and delightful of our later essayists, revealing everywhere acuteness, humour, a satire which gives no pain, and a quiet depth of moral feeling and sense of man's social responsibilities; while his style possesses in a rare degree the qualities of grace, clearness, and distinction.

Helsingborg, an ancient seaport of southern Sweden, 32 miles NW. of Malmö, on the Sound, opposite Elsinore (Dan. *Helsingör*). It is connected by branch-lines with the railway from Stockholm to Malmö. There are a good harbour, some fishing, and some trade (6500 vessels annually in and out). It figures several times in the wars between Sweden and Denmark. Pop. (1875) 9471; (1890) 20,410.

Helsingfors, a fortified seaport, capital of the grand-duchy of Finland, and after Cronstadt the most important naval station on the Baltic, is beautifully situated on a peninsula, surrounded by islands and rocky cliffs, in the Gulf of Finland, 191 miles W. from St Petersburg by sea and 256 by rail. A series of formidable batteries, called the fortifications of Sveaborg, and consisting of seven strongly-fortified islands and numerous islets belonging to Russia, protect the entrance to the harbour, and are of such strength, and so well appointed, as to warrant the application to them of the name of the Northern Gibraltar. The whole front presented by the successive works is more than a mile in length, and, besides the casemates for small-arms, the united fortresses mount about 300 guns or mortars, and are garrisoned by 12,000 men in war-time, there being only about 2000 men in time of peace. The harbour itself is further defended by two forts. Helsingfors is the largest and handsomest town of Finland; the broad streets intersect at right angles, and there are several fine parks and public squares. Of the public buildings the most striking are the house in which the diet meets, the senate-house, and the university buildings. There are also three very handsome churches. The university, removed hither from Abo in 1828, where it had been founded in 1640, comprises four faculties, and in 1888 had 45 professors, and 1703 students inscribed on the lists, of whom 12 were ladies, but of whom only 1002 were actually in residence. In connection with it are a library of 200,000 volumes, a hospital, a botanic garden, and a valuable observatory. Helsingfors is a favourite bathing-place, and attracts many visitors during summer from St Petersburg. The town carries on a considerable trade in Baltic produce; it exports chiefly timber, paper, and butter, and imports iron and steel goods, with machinery, fancy articles, colonial wares, &c. Pop. (1870) 32,113; (1889) 64,817; (1895) 73,820. with the garrison.

Helsingfors was founded by Gustavus I. of Sweden in the 16th century, but the site of the town was removed nearer the shore in 1639. In 1819 it became the capital of Finland. In August 1855, during the Crimean war, Sveaborg was bombarded for two days and nights by a section of the allied fleet, without any material impression being made upon the forts. Helsingfors has still many Swedish characteristics, the majority of the population being of Scandinavian origin, hence Swedish is the tongue generally spoken. The Finnish language, however, is beginning to assert itself.

Helst, Bartholomæus van der, a Dutch painter, was born (according to tradition) at Haarlem in 1613. He was joint-founder in 1654 of the painters' guild of St Luke at Amsterdam, where he lived, and where he died in 1670. He attained great celebrity as a portrait-painter. Some of his pictures seem to bear traces of Franz Hals's influence. One of his works at Amsterdam, a 'Muster of the Burgher Guard,' with thirty full-length figures, was pronounced by Sir Joshua Reynolds to be 'the first picture of portraits in the world.' His later creations are inferior in merit to the pieces painted before 1650. Numerous paintings by him exist in European galleries.

Helston, an old market-town and municipal borough of Cornwall, 10 miles WSW. of Falmouth. It was made a borough by King John in 1201; and from the reign of Edward I. to 1832 it sent two members to parliament, and one till 1885. It has long been noted for its *Furry* or *Flora Dance*, held on the 8th May. A branch-line from Gwinear Road was opened in 1887. Pop. (1891) 3198.

Helvella, a genus of fungi, of the class Ascomycetes (see Fungi), having the *pileus* turned downwards, lobed and folded, and the surface of the *hymenium* even. Some of the Helvellæ are edible, and much used in Germany.

Helvellyn, one of the highest mountains of England, in the west of Cumberland, between Keswick and Ambleside. It is 3118 feet high, is easy of ascent, and commands magnificent views.

Helvetia, a Swiss colony (founded 1856) in the Argentine Republic, in the Gran Chaco, 80 miles N. of Santa Fé. Pop. 2500.—For ancient Helvetia, see Helvetii, Switzerland. For the Helvetic Confessions, see Confessions of Faith; and for the Helvetic Republic, see Switzerland.

Helvetii, a Celtic people inhabiting, according to Cæsar, the region between the mountains of Jura on the west, the Rhone on the south, and the Rhine on the east and north, the region corresponding pretty closely with the western part of modern Switzerland. Their chief town was *Aventicum*, and they were divided into four *pagi* or cantons, of

which the most important was the *pagus Tigurinus*. They are first mentioned in the war with the Cimbri, but the chief event in their history is their attempted irruption into and conquest of southern Gaul, in which they were repulsed by Cæsar with frightful slaughter, 58 B.C. Fortunately we have the story in the terse but vivid narrative of Cæsar. They collected three months' provisions, burned down their twelve towns and 400 villages, and made a general rendezvous by Lake Leman in the spring of the year. Cæsar hastened to Geneva, destroyed the bridge, raised two legions in Cisalpine Gaul, and when the Helvetians sent delegates to demand a passage, delayed them until he had built a wall along the Rhone, 16 feet high and about 19 Roman miles in length, flanked with redoubts. After vainly attempting to pass this barrier, the Helvetii took another route, but were followed and defeated with terrible slaughter at Bibracte (*Autun*), and the remnant obliged to return to their own country, where they became subject to the Romans, who overawed all disaffection by the fortresses which they built, *Noviodunum*, *Vindonissa*, *Aventicum*. Of 368,000 who left their homes, including 92,000 fighting-men, only 110,000 are said to have returned. See SWITZERLAND.

Helvétius, CLAUDE ADRIEN, one of the French Encyclopædists, was of Swiss origin, and was born at Paris in 1715. He was trained for a financial career, and in 1738 was appointed to the lucrative office of farmer-general. But this post he quickly resigned for the situation of chamberlain to the queen's household. At this time he associated much with the French philosophers of the day, Diderot, D'Alembert, Holbach, and others. In 1751 he withdrew to a small estate at Voré (Le Perche), where he spent the most of his life in the education of his family, the improvement of his peasantry, and in literary labours. In 1758 appeared his celebrated work, *De l'Esprit*, in which, carrying out, as he thought, the work of Locke, he endeavoured to prove that sensation is the source of all intellectual activity, and that the grand lever of all human conduct is self-gratification. The book created an immense sensation. It was denounced by the doctors of the Sorbonne, and condemned by the parliament of Paris to be publicly burned. Everybody read it, and it was translated into the principal European tongues. Helvétius died at Paris, 26th December 1771, leaving behind him a work, *De l'Homme, de ses Facultés, et de son Education* (2 vols. Lond. 1772). His collected works were published in 14 vols. at Paris in 1796, and again in 3 vols. in 1818. See Morley's *Diderot and the Encyclopædists* (1878).

Helvoetsluys, or HELLEVOETSLUIS, a fortified seaport of South Holland, on the Haring-Vliet, an arm of the Maas, 17 miles SW. of Rotterdam. It has an excellent harbour, and is to Rotterdam and the mouth of the Maas what the Helder is to Amsterdam and the Zuider Zee. There is a school of navigation. Here William III. embarked for England, November 11, 1688. Pop. 4362.

Hemans, FELICIA DOROTHEA, poetess, was born at Liverpool, 25th September 1793. Her father, George Browne, was a Liverpool merchant, of Irish extraction; her mother, whose maiden name was Wagner, was of mixed Italian and German descent. Felicia was distinguished for her beauty and precocity, and at an early age she manifested a taste for poetry, in which she was encouraged by her mother. Family reverses led to the removal of the Brownes to Wales, where the young poetess imbibed a strong passion for nature, read books of chronicle and romance, and gained a working knowledge of the German, Italian, Spanish, and Portuguese languages. She also cultivated her excellent musical taste. Her first volume was published in 1808, when she was only fifteen years of age, and contained a few pieces written about four years earlier; her second, entitled *The Domestic Affections*, appeared in 1812. In the same year she married Captain Hemans of the 4th Regiment, whose health had suffered in the retreat on Corunna, and afterwards in the Walcheren expedition, and who settled in Italy in 1818. After this time they never met again; their marriage was understood not to have been happy. Mrs Hemans, though in poor health, now devoted herself to the education of her children, to reading and writing, and spent the rest of her life in North Wales, Lancashire, and latterly at Dublin, where she died, 16th May 1835. Her principal works are: *The Vespers of Palermo*, a tragedy (1823), which proved a failure when acted at Covent Garden; *The Siege of Valencia, The Last Constantine, and other Poems* (1823); *The Forest Sanctuary* (1827); *Records of Women* (1828); *The Songs of the Affections* (1830); and *Hymns for Childhood, National Lyrics and Songs for Music* (1834); and *Scenes and Hymns of Life* (1834). A volume of *Poetical Remains* was published after her death, and subsequently a complete edition of her works, with a memoir by her sister, was issued in 7 vols. (1839). During a visit that she paid to Abbotsford, Scott complimented her on her musical talents: 'I should say you had too many gifts, Mrs Hemans, were they not all made to give pleasure to those around you.' And on parting he said: 'There are some whom we meet and should like ever after to claim as kith and kin; and you are one of these.'

Mrs Hemans, without great originality or force, is yet sweet, natural, and pleasing. But she was too fluent, and wrote much and hastily; her lyrics are her best productions; her more ambitious poems, especially her tragedies, being, in fact, quite insipid. Still, she was a woman of true genius, though her range was circumscribed, and some of her little lyrics, *The Voice of Spring*, *The Better Land*, *The Graves of a Household*, *The Treasures of the Deep*, and *The Homes of England*, are perfect in pathos and sentiment, and will live as long as the English language. These are found in almost every school collection, and this early familiarity with her sweet and simple lyrics has helped to keep her memory green.

Besides her sister's memoir, there are *Memorials* by H. F. Chorley (1836); *Recollections* by Mrs Lawrence (1836); *Poetical Remains*, with memoir by Delta (1836); and *Poetical Works*, with memoir by W. M. Rossetti (1873). See also Espinasse's *Lancashire Worthies* (1874).

Hematite. See HÆMATITE.

Hemel Hempstead, a market town of Hertfordshire, 23 miles NW. of London, a centre of the straw-plaiting industry. It has also paper-mills, iron-foundries, tanneries, and breweries. Pop. of parish (1851) 7073; (1891) 9678.

Hemerocallis. See DAY-LILY.

Hemianopia (Gr. *hemi*, 'one-half,' *an*, 'not,' and *ops*, 'the eye'), vision limited to one-half of an object—a peculiar and rare form of disease, generally due to disease within the brain.

Hemicrania. See HEADACHE.

Hemidesmus. See SARSAPARILLA.

Hemiplegia (Gr. *hemi*, 'one-half,' and *plēssō*, 'I strike'), Paralysis (q.v.) limited to one side of the face and body, and usually depending upon disease of the brain. Opposed in signification to Paraplegia.

Hemipode. See QUAIL.

Hemip'tera (Gr., 'half-winged'), a large order of insects, to which the general term 'bugs' is often

applied, or the more modern title Rhynchota, in allusion to the characteristic suctorial proboscis. The order includes (1) forms with similar wings (Homoptera)—e.g. coccus insects, aphides, Cicadas (q.v.); (2) others with dissimilar wings (Heteroptera)—e.g. water-bugs, water-scorpions; and (3) parasites or Lice (q.v.).

Hemlock (*Conium*), a genus of plants of the natural order Umbelliferæ, having compound umbels of small white flowers, small general and partial involucres, the limb of the calyx merely rudimentary, and a compressed ovate fruit with five prominent wavy ridges and no *vittæ*. The best-known and only important species is the Common

Flowers and Root of Common Hemlock (*Conium maculatum*): *c*, a flower; *d*, a seed.

or Spotted Hemlock (*C. maculatum*), which grows by waysides, on heaps of rubbish, and in other similar situations in Britain and on the continent of Europe, in some parts of Asia, and now also as a naturalised plant in North America and in Chili. It has a root somewhat resembling a small parsnip; a round, branched, hollow, bright-green stem, 2 to 7 feet high, generally spotted with dark purple; the leaves large, tripinnate, of a dark shining green colour; the leaflets lanceolate, pinnatifid. All parts of the plant are perfectly destitute of hairs, and it is the only British species of the order Umbelliferæ which has the stem smooth and spotted with purple. Both the general and partial umbels have many rays. The general involucres consist of several small leaflets, the partial involucres of three small leaflets, all on one side. The whole plant has a nauseous smell, particularly if rubbed or bruised. The leaves and fruit are the parts of the plant employed in medicine. The former should be gathered just before the time or at the commencement of flowering, and after the removal of the larger stalks they should be quickly dried by a heat not exceeding 120°. They should then be preserved in perfectly closed tin canisters. The fruit is gathered when fully developed, but still green, and should be carefully dried.

The most important ingredient in hemlock is the alkaloid conine, a volatile, colourless, oily, strongly alkaline substance, $C_8H_{17}N$, but it also contains two other alkaloids—methylconine and conhydrine. The fruit contains about one-fifth per cent. of it, the other parts of the plant merely traces. It is obtained by distilling the seeds with water which contains a little potash in solution; the conine passes over with the water in the form of a yellowish oil, and is purified by redistillation. Conine has lately been prepared artificially by Schiff. Conhydrine, $C_8H_{17}NO$, is a solid volatile alkaloid, and is much less poisonous than conine. Conine and methylconine are extremely poisonous, and cause death by their action on the nervous system. The action of conium depends of course on the combined effects of the active principles contained in the plant. The symptoms of conium poisoning are weakness and staggering gait, passing on to paralysis, which gradually passes up the cord until it reaches the respiratory centre, when death ensues. Dilatation of the pupil, ptosis, and asphyxial convulsions are symptoms also seen.

In medicine, it is given internally as a sedative to the nervous system in chorea, incontinence of urine, paralysis agitans, and other affections. It is also employed as a vapour to relieve cough. It may be administered internally in the form of powder (of the leaves), succus, tincture, or extract, while externally it may be applied as a soothing application to ulcers, painful piles, &c., in the form of ointment or poultice. The succus is considered the best preparation, the others often containing no active principle.

In cases of poisoning by hemlock, the evacuation of the stomach is the first thing to be attended to. Among the ancient Greeks, poisoning by hemlock was a common mode of death for condemned criminals, and thus it was that Socrates died.—Water Hemlock, or Cowbane (*Cicūta virosa*), is also an umbelliferous plant, of a genus having much-vaulted umbels, a five-toothed calyx, and almost globose fruit, each carpel with five broad flattened ribs and evident single *vittæ*. Water hemlock grows in ditches, on the margins of ponds, and wet grounds in Europe and the north of Asia. It is more common in Scotland than in England. It has a large fleshy white root, covered externally with fibres; an erect much-branched stem, 2 to 5 feet high; tripinnate leaves, with linear-lanceolate regularly and sharply serrated leaflets; no general involucre, or only a single small leaflet, partial

Water Hemlock (*Cicūta virosa*).

involucres of many short narrow leaflets; and white flowers. It contains an active principle, *Cicutoxine*, and an essential oil. It causes tetanic spasms, insensibility, vomiting, and diarrhœa. Fatal results have occurred from eating the root. Another species, *C. maculata*, is common in North America, growing in marshy places. It has a spotted stem, like that of true hemlock, the name of which it very generally receives in North America. The leaves are triternate, the leaflets ternate. It is a very poisonous plant, and is the cause of many deaths.—The *Cicuta* of the Romans was the *Conium* of modern botanists (Gr. *konneion*), as water hemlock does not grow in Italy or Greece.

The ornamental plant, the so-called Giant Hemlock, which in good rich soil reaches a height of 12 to 15 feet in three months, is not really a hemlock at all, but a giant Cow-parsnip (q.v.).

Hemlock Spruce. See FIR.

Hemorrhage. See BLEEDING.

Hemp (*Cannabis*), a genus of plants of the natural order Cannabinaceæ (q.v.), having the male and female flowers on different plants: the male flowers with five-partite calyx and five stamens; the female flowers with a spathe-like calyx of one leaf, rolled round the ovary and partially split along one side, and two threadlike stigmas. There is only one known species (*C. sativa*), varying considerably, however, from soil, climate, and cultivation. It is an annual plant, a native of the warmer parts of Asia, but has been cultivated in Europe from the earliest historic times, and is now naturalised in many parts of Europe and America. Like flax, it adapts itself wonderfully to diversities of climate, and is cultivated equally under the burning sun of the tropics and in the northern parts of Russia.

Common Hemp (*Cannabis sativa*), male plant.

It is, however, readily injured by frost, particularly when young; and in many countries where it is cultivated it succeeds only because the warmth of the summer, though of short duration, is sufficient for its whole life. Hemp varies very much in height, according to the soil and climate, being sometimes only 3 or 4 feet, and sometimes 15 or 20 feet, or even more. Notwithstanding the coarseness of its leaves, it is an elegant plant, and is sometimes sown on this account in shrubberies and large flower-borders. The stem is erect, more or less branched; the leaves are five to nine fingered. The flowers are yellowish-green, small, and numerous; the male flowers in axillary racemes on the upper parts of the plant; the female flowers in short axillary and rather crowded spikes. The female plants are higher and stronger than the male. The stem of hemp is hollow, or only filled with a soft pith. This pith is surrounded by a tender, brittle substance, consisting chiefly of cellular tissue, with some woody fibre, which is called the *reed*, *boon*, or *shove* of hemp. Over this is the thin bark, composed chiefly of fibres extending in a parallel direction along the stalk, with an outer membrane or cuticle.

Hemp is cultivated for its fibre in almost all countries of Europe, and in many other temperate parts of the world, most extensively in Poland, and in the centre and south of European Russia, which are the chief hemp-exporting countries. French hemp is much esteemed in the market, as is also that of England and Ireland, of which, however, the quantity is comparatively inconsiderable. *Bolognese Hemp* and *Rhenish Hemp* are varieties remarkable for their height; and a fibre of very fine quality, 8 or 9 feet long, is known in commerce by the name of *Italian Garden Hemp*. In the United States most of the hemp is grown in Kentucky. In England the cultivation of hemp is almost confined to Lincolnshire, Holderness in Yorkshire, and a few other districts, of which the moist alluvial soil is particularly suited to it. In cultivating hemp it is very necessary to have the soil so rich, and to sow the seed at such a season, that the plants shall grow rapidly at first, as they thus form long fibres. A crop of short scrubby hemp is almost worthless. The finer kinds of hemp are used for making cloth, the coarser for sailcloth and ropes. Hemp sown thin produces a coarser fibre than hemp sown thick. Something also depends on the time of pulling, for the crop is pulled by the hand. When a rather fine fibre is wanted, and the seed is not regarded, the whole crop is pulled at once, soon after flowering; otherwise, it is usual to pull the male plants as soon as they have shed their pollen, and to leave the female plants to ripen their seed, in which case the fibre of the female plants is much coarser. The treatment of hemp by *retting*, &c. is similar to that of Flax (q.v.). The fibre of hemp is generally used for coarser purposes than that of flax, particularly for sailcloth, pack-sheet, ropes, and the caulking of ships.

Common Hemp, female plant.

The seed of hemp is produced in great abundance. It is commonly sold as food for cage-birds; and birds are so fond of it that not only the ripening fields, but the newly-sown fields, must be carefully guarded against their depredations. A fixed oil, *oil of hempseed*, is obtained from it by expression, which is at first greenish-yellow and afterwards yellow, and has an acrid odour, but a mild taste. This oil is used in Russia for burning in lamps, although the wick is apt to get clogged, also for making paints, varnish, and a kind of soft soap.

Hemp is cultivated in warm countries not so much for its fibre as for a resinous secretion, which has narcotic or intoxicating qualities (see HASHISH). Hemp is also used as a therapeutic agent under the name of Indian Hemp, or Bhang, and may be administered in the form of resinous extract or of tincture; and it is usually prescribed (like opium) for its hypnotic, anodyne, and antispasmodic properties. Although less certain in its action than opium, it possesses these advantages over that drug—that it does not constipate the

bowels, create nausea, or check the secretions, and that it is less likely to occasion headache.

The name Hemp (Ger. *Hanf*) is from the Greek and Latin *cannabis*, and that from Sanskrit *ganja*. The name hemp is often extended with some distinctive prefix to many of the fibres used for ropes and coarse fabrics—Sunn Hemp, Manilla Hemp, Deccan Hemp, Sisal Hemp, &c. See APOCYNACEÆ, BOWSTRING HEMP, FIBROUS SUBSTANCES.

Hemp Palm (*Chamærops excelsa*; see CHAMÆROPS), a palm of China and Japan, the fibre of the leaves of which is much employed in those countries for making cordage. Hats are also made of its leaves, and even cloaks and other garments for wet weather.

Hems, HOMS, or HUMS (Lat. *Emesa*), a city of Syria, is situated near the right bank of the Orontes, 63 miles NE. of Tripoli. It is surrounded by ancient walls, now greatly ruined, and is entered by six gates. Its streets are narrow and dirty, and its houses mean. In ancient times it was chiefly celebrated for its temple of the Sun, now destroyed, though probably its site is occupied by the dilapidated castle or fortress, ruined by Ibrahim Pasha in 1831. One of the priests of this temple, Heliogabalus, was raised to the imperial throne of Rome in 218. Under the walls of Hems (Emesa) Zenobia was defeated by the Emperor Aurelian in 272. In 636 the city was taken by the Saracens, when its old Semitic name Hems was revived; and in 1098 it fell into the hands of the Crusaders. It has a considerable trade in oil, cotton, and sesame, and produces, besides these commodities, silk goods and gold wares. Pop. about 20,000.

Hemsterhuis, TIBERIUS, Dutch philologist, was born at Groningen, 1st February 1685. He became professor of Greek at Franeker in 1720, and of Greek history at Leyden in 1740, where he died 7th April 1766. One of the greatest Greek scholars of his time, Hemsterhuis may be said to have created a new school of Greek philology, to which belong his distinguished pupils Ruhnken and Valckenaer. His editions of the *Onomasticon* of Pollux (1706), of the *Select Dialogues* of Lucian (1708 and 1732), and of the *Plutus* of Aristophanes (1744, by Schäfer 1811) are his principal literary works. A beautiful picture of his life is given in Ruhnken's *Elogium Hemsterhusii* (1768 and 1789), republished in Lindemann's *Vitæ duumvirorum T. Hemsterhusii et D. Ruhnkenii* (Leip. 1822). From Hemsterhuis's MSS. *Anecdota Hemsterhusiana* (1825) have been edited by Geel, and *Orationes et Epistolæ* (1839) by Friedemann.

Hen. See POULTRY.

Henbane (*Hyoscyamus*), a genus of plants of the natural order Solanaceæ, having a five-toothed calyx, an irregular, funnel-shaped corolla, and a capsule opening by a lid and enclosed in the hardened calyx. The species are mostly annual and biennial herbaceous plants, and natives of the countries near the Mediterranean Sea. The only species found in Britain is the Common Henbane (*H. niger*), which is not uncommon in waste places and in the neighbourhood of towns and villages, particularly in calcareous soils, and on the sandy shores of Scotland. It is an annual plant, somewhat bushy, about 2 feet high, with large sinuated or sharply-lobed leaves without leaf-stalks, and large dingy yellow flowers with purplish veins. The whole plant is covered with unctuous hairs, and has a nauseous smell, which gives warning of its strong narcotic poisonous quality. Cases of poisoning by henbane are, however, not rare, but are more frequently owing to the proceedings of quacks than to any mistake of the plant for an esculent.

The seeds contain in largest quantity the peculiar alkaloid on which the properties of the plant chiefly depend, *Hyoscyamia* or *Hyoscyamin*, which crystallises in stellated acicular crystals of a silky lustre.

Henbane (*Hyoscyamus niger*).

The symptoms of poisoning by henbane are similar to those produced by other narcotic poisons, and the proper treatment is the same as in cases of poisoning by opium. In medicine henbane is employed both externally and internally. The leaves are the part commonly used; they are gathered and quickly dried when the plant is in full flower. Fomentations of henbane are applied to painful glandular swellings, parts affected with neuralgia, &c., and are often found to afford relief. An extract of henbane is sometimes employed instead of belladonna to dilate the pupil of the eye. Tincture and extract of henbane are often administered in cases of annoying cough, spasmodic asthma, and other diseases requiring sedatives and antispasmodics. Henbane is also employed to calm mental irritation and to induce sleep. For many cases it has one great advantage over laudanum, in not producing constipation. The smoke from the burning seeds of henbane is sometimes introduced into a carious tooth to relieve toothache.

The other species of henbane possess similar properties. The dried stalks of *H. albus* are used by smoking in Greece to allay toothache.

Henderson, capital of Henderson county, Kentucky, on the Ohio, 10 miles S. of Evansville by rail, with nearly a score of tobacco-factories and warehouses, and a number of mills. Pop. 5365.

Henderson, ALEXANDER, a famous Scottish ecclesiastic, born in 1583, and educated at St Andrews, where in 1610 he was placed in the chair of Rhetoric and Philosophy, being soon after presented by Archbishop Gladstanes to the living of Leuchars, in Fife. Although the nominee of a prelate, he soon embraced the popular cause, and became one of its foremost leaders. He is supposed to have had a great share in drawing up the *National Covenant;* he withstood to the face the lukewarm theologians of Aberdeen, and was unanimously placed in the moderator's chair at the memorable General Assembly at Glasgow in November 1638, which in the face of the king's commissioner restored all its liberties to the Kirk of Scotland. In all the tortuous negotiations with the king Henderson took a principal part, and had many interviews with him. He was moderator at Edinburgh in 1641, and again in August 1643, and drafted the famous *Solemn League and Covenant*.

which was soon adopted also by the English parliament. Henderson was one of the Scottish commissioners that sat in the Assembly of Divines at Westminster, and in its work spent his last three years in England. He died at Edinburgh, 19th August 1646, and was buried in Greyfriars' Churchyard. See the Lives by Aiton (1836) and M'Crie (1846), and Baillie's *Letters and Journals*.

Hendricks, Thomas Andrews, vice president of the United States, was born in Ohio, 7th September 1819, and admitted to the Indiana bar in 1843. He served one term in the state legislature, sat in congress from 1851 to 1855, and in the United States senate from 1863 to 1869, and in 1872 was elected governor of Indiana. In 1876 he was the Democratic candidate for the vice presidency, but was not returned (see Hayes, R. B.); in 1884 he was elected. He died 25th November 1885.

Henequen, or Sisal Hemp. See Fibrous Substances.

Hengist (A.S. 'stallion') and **Horsa,** the names of the two brothers who led the first band of Teutonic invaders to Britain. They are mentioned by Nennius and the *Anglo-Saxon Chronicle*, so that we need not insist upon the suspicious etymologies of the names so far as to dismiss their story as a myth. According to the story they came about the year 449 to help King Vortigern against the Picts, and were rewarded for their services with a gift of the Isle of Thanet. Soon after they turned against Vortigern, but were defeated at Aylesford, where Horsa was slain. Ere long, however, Hengist is said to have conquered the whole of Kent.

Hengstenberg, Ernst Wilhelm, a famous German champion of orthodox theology, was born 20th October 1802, at Fröndenberg, in Westphalia, where his father was clergyman. Prepared by his father for the university, he devoted himself at Bonn chiefly to Orientalia and philosophy, whilst at the same time he took an enthusiastic part in the *Burschenschaften*. At first a sympathiser with rationalism, at Basel, whither he went in 1823, he passed over to the opposite extreme, and going next year as *privat-docent* to Berlin, soon put himself at the head of a rising orthodox party, whose principles he championed vigorously both in the university and through the press. In 1826 he was made extra-ordinary, in 1828 ordinary professor; and in 1829 doctor of theology. His *Evangelische Kirchenzeitung*, begun in 1827, combated rationalism even in its mildest forms, seeking to restore the orthodoxy and church discipline of the 16th and 17th centuries. All his works were devoted to the defence of the old interpretation and criticism of the Scriptures against the results of modern biblical science in Germany. Hengstenberg's great influence in ecclesiastical matters was employed in the carrying out of the high Lutheran dogmas of the church, of church-offices, and of the sacraments, by persecution of sectaries, by opposition to the union of Lutherans and Reformed, and by attempts to depose from their chairs Gesenius, Wegscheider, De Wette, and other so-called rationalistic teachers in the universities. He died at Berlin, May 28, 1869.

His chief works were *Beitrage zur Einleitung ins Alte Testament* (1831–39; Eng. trans. 1847 and 1848); *Christologie des Alten Testaments* (2d ed. 1854–57; Eng. trans. 4 vols. 1854–59); *Geschichte des Reiches Gottes unter dem Alten Bunde* (1869–70; Eng. trans. 1871–72); *Die Weissagungen des Propheten Ezechiel* (1867–68; Eng. trans. 1869); *Die Juden und die Christl. Kirche* (1857); and *Die Bücher Mosis und Aegypten* (1841; Eng. trans. 1845). His commentaries on the Psalms (1842–45; Eng. trans. 1845–48), the Apocalypse (1850–51; trans. 1852), and the Gospel of St John (1861–62; trans. 1865). See his Life by Bachmann and Schmalenbach (1876–92).

Henley, John, commonly known as Orator Henley, the son of the vicar of Melton Mowbray, in Leicestershire, where he was born on 3d August 1692, set up in London in 1726 what he called an 'oratory,' whence he professed to teach universal knowledge in week-day lectures and primitive Christianity in Sunday sermons. He dubbed himself the 'restorer of ancient eloquence,' and practised in the pulpit the arts of the theatrical attitudinarian. He sold medals of admission to his lectures and sermons, bearing the device of a rising sun, with the motto *Ad summa* and the inscription *Incessum erat et facies*. Yet he was not without genius as an orator, and by this and his eccentricities attracted during several years large crowds to hear him preach and teach. And he doubtless drew many by his queer advertisements, sometimes quaint, sometimes sarcastic, but always designed to catch the curious and the idle. His addresses were a strange mixture of solemnity and buffoonery, of learning and ribaldry, of good sense and personalities, of wit and absurdity. Pope spits him on his literary lance in the *Dunciad:*

> Endless was all [illegible] Henley stands,
> Tuning his voice and balancing his hands.
> How fluent nonsense trickles from his tongue!
> How sweet the periods, neither said nor sung!
> Oh great restorer of the good old stage,
> Preacher at once and zany of thy age!

Nevertheless he was not altogether ridiculous; he was a man of considerable knowledge, and had even some learning in oriental matters. Whilst still an undergraduate at Cambridge he sent a witty letter to the *Spectator* (1712), and in 1714 published a poem, *Esther*, which contains several passages indicative of imagination, and couched in elegant verse. After he left Cambridge he taught in the school of his native town, and there his bubbling energy introduced several reforms and innovations. At this time he compiled a grammar of ten languages, *The Complete Linguist* (1719–21). He went to London, where he earned his livelihood by writing; he was also a pensioner of Walpole, and edited a weekly paper. He died 13th October 1756. His *Oratory Transactions* contain a Life of himself.

Henley, William Ernest, LL.D., poet, playwright, critic, and editor, was born at Gloucester, 23d August 1849. Months of sickness in Edinburgh Infirmary (1873–75) bore fruit in *A Book of Verses* (1888), which won much attention, and was followed by *Views and Reviews* (1890), *The Song of the Sword* (1892), &c. Mr Henley has also been editor of the *Magazine of Art*, the *Scots* (or *National*) *Observer*, and the *New Review*, besides editing Burns and Byron. He collaborated with R. L. Stevenson in three plays, *Deacon Brodie*, *Beau Austin*, and *Admiral Guinea* (reprinted 1892).

Henley-on-Thames, a municipal borough of Oxfordshire, at the base of the Chiltern Hills, and on the left bank of the Thames, 8 miles NE. of Reading, 36 W. of London, and 24 SE. of Oxford by road (by river 47). The five-arch bridge was built in 1786 at a cost of £10,000; the parish church, Decorated in style, was restored in 1864; and the grammar-school was founded in 1605. Malting is a principal branch of industry; there are also breweries, and a considerable trade in corn, flour, and timber. The principal amateur regatta of England has been held here every summer since 1839. Pop. (1851) 2595; (1881) 4604; (1891) 4913. See Rowing; also J. S. Burn, *A History of Henley-on-Thames* (1861).

Henna, a small shrub, called by botanists *Lawsonia alba* (also *L. inermis* or *spinosa*, the younger bushes being spineless). It is also known as 'Egyptian privet' or 'Jamaica mignonette.' Henna grows in moist situations through

out the north of Africa, Arabia, Persia, and the East Indies. It is cultivated in many places for the sake of its flowers, which are much prized for their fragrance, particularly by the Egyptian ladies; but still more for the sake of the leaves, which abound in colouring matter, and which, being dried, powdered, and made into a paste with hot water and catechu, are very generally employed by women throughout the East to stain the nails and tips of the fingers and parts of their feet of an orange colour; also by men to dye their beards, the orange colour being converted into a deep black by indigo; and for dyeing of the manes and hoofs of horses, and to dye skins and leather reddish-yellow. Powdered henna leaves form a large article of export from Egypt to Persia, and to various parts of Turkey, from which they find their way to more northern countries, and even to Germany, to be employed in dyeing furs and some kinds of leather. The use of henna for staining the nails appears—from allusions in ancient poets, and from some of the Egyptian mummies—to have prevailed from very ancient times. It is perhaps the camphire of the Bible. The use of henna for hands and feet is said to check perspiration, and gives a feeling of coolness. The process has to be repeated every two or three weeks.

Hennegau. See HAINAULT.

Henningsen, CHARLES FREDERICK, an English soldier of fortune and author, was born in 1815, served with the Carlists in Spain, where he rose to the command of the cavalry, with the Russians in Circassia, with Kossuth in Hungary, and with Walker in Nicaragua. In the American civil war he commanded a brigade on the Confederate side; and he afterwards was employed to superintend the manufacture of Minié rifles. He died at Washington, 14th June 1877. His books are for the most part records of travel and personal adventure, but include also *The Past and Future of Hungary* (1852), and *The White Slave*, a novel.

Henotikon (Gr. *henōtikos*, 'serving to unite'), an edict for uniting the Eutychians with the church, issued by the Emperor Zeno in 482 A.D.

Henrietta Maria, born at the Louvre, 25th November 1609, was the youngest child of Henry IV. of France, whose assassination six months afterwards left the babe to the unwise upbringing of her mother, Marie de Medicis. A lovely little thing, bright of eye and wit, but spoilt and wayward, she was married in 1625 to Charles I., and speedily evinced her bigotry, if not by a barefoot pilgrimage to Tyburn, yet by refusing to share in her husband's coronation. The dismissal, however, of her French attendants, and the murder of Buckingham, removed two conflicting causes of jealousy; and for ten years Henrietta might call herself 'the happiest woman in the world—happy as wife, mother, and queen.' But she had also made herself the best-hated woman in England. Strafford fallen (she did her worst to save him), and herself menaced with impeachment, on 23d February 1642, the eve of the Great Rebellion, she parted from Charles at Dover, and, repairing to Holland, there raised £2,000,000. A year later, after a great storm, during which she bade her ladies 'Take comfort: queens of England are never drowned,' she landed at Bridlington (q.v.), and, marching through England, again met King Charles near Edgehill. She sojourned with him at Oxford, until on 3d April 1644 they separated at Abingdon, never to meet on earth. At Exeter, on 16th June, she gave birth to a daughter, and in less than a fortnight had to flee before Essex to Pendennis Castle, whence she took shipping for France. A cruiser gave chase, and she charged the captain to blow up the magazine sooner than let her be captured; but at length she landed on the coast of Brittany. A liberal allowance was assigned her, but she pinched herself to send remittances to England; and the war of the Fronde (1648) had reduced her for a time to destitution, when, nine days after the event, news reached her of her husband's execution. That even this crowning sorrow failed to teach wisdom is shown by her quarrels with her wisest counsellors, and her efforts to convert her children. The story, however, of her secret marriage to her confidant, Henry Lord Jermyn (afterwards Earl of St Albans), rests solely on gossip. After the Restoration, 'la Reine Malheureuse,' as she called herself, paid two visits to England—one of four months in 1660–61, the other of three years in 1662–65. Pepys describes her as 'a very little, plain old woman.' She died of an overdose of an opiate on 31st August 1669, at her château of Colombes, near Paris, and was buried (Bossuet preaching the funeral sermon) in the abbey of St Denis, whence her coffin was ousted at the Revolution.

See CHARLES I. and works there cited; also Strickland's *Queens of England* (new ed. vol. v. 1851).

HENRIETTA, DUCHESS OF ORLEANS, Charles I.'s youngest child, was born 16th June 1644. Her mother, Henrietta Maria, had to leave her behind at Exeter, which in April 1646 was taken by Fairfax; but three months afterwards, disguised as a French beggar-woman, her governess, Lady Dalkeith, escaped with her from Oatlands to Calais. Her mother brought her up a Catholic. Gay, brilliant, beautiful, in 1661 she was married to Louis XIV.'s only brother, Philip, Duke of Orleans; 'of all the love he had borne her there soon remained nothing but jealousy.' As Louis's ambassadress, in 1670 she wheedled Charles II. into signing the secret treaty of Dover; and she had been back in France little more than a fortnight, when on 30th June she died at St Cloud—almost certainly of poison, but possibly without her husband's cognisance.

See CHARLES II. and works there cited; Mdme. de la Fayette's *Histoire d'Henriette d'Angleterre* (1720; new ed. by An. France, 1882); Mrs Everett Green's *Princesses of England*; and monographs by Baillon (French, 1855) and Julia Cartwright (Mrs Ady; 1893).

Henry I., king of England, the youngest and only English-born son of William the Conqueror, was born in 1068, according to tradition at Selby, in Yorkshire. His father left him £5000, with a part of which he bought the districts of the Cotentin and the Avranchin from his brother, Robert of Normandy; and, when war broke out between William Rufus and Robert, Henry, although he had been imprisoned by the latter, helped him to defend Normandy, and saved his capital city, Rouen, for him. Yet in the treaty which followed (1091) he was excluded from the succession, and his brothers joined to deprive him of his lands. Immediately after the death of William he rode to Winchester, seized the royal treasure, and in the absence of Robert, who was then on his way home from crusading in Palestine, was elected king by such of the Witan as were at hand, and crowned at Westminster four days after. He at once issued a charter restoring the laws of Edward and the Conqueror, recalled Anselm, and set about the stern reforms which gained him among his people the name of the Lion of Justice. He also strengthened his position by a marriage with Eadgyth (her name was changed to Matilda), daughter of Malcolm of Scotland and the good Queen Margaret, who was descended from the old English royal house. The highest honours under Henry, both in church and state, were

strictly withheld from men of English blood; yet it was on the native English support that the king relied; and in 1101, when the nobles conspired to bring in Robert, who had now returned home, the English stuck faithfully by the king born in their own land, and the Normans were powerless. Without a battle Robert was induced to resign his claims, and Henry then established his power so securely that there was peace in England to the end of his reign. On the Scottish border also there was peace, and only twice (1114 and 1121) did Henry feel compelled to make expeditions into Wales. His controversy with Anselm (q.v.) regarding investiture, too, was conducted without bitterness on either side, and resulted in a compromise; while a later dispute with the papal see was ended in 1119 by Calixtus solemnly confirming the ancient customs of England.

Robert had received a pension of 3000 marks, but in 1105-6 Henry made war upon his badly governed duchy; Robert was defeated in a bloody battle beneath the walls of Tinchebrai, on September 28, 1106, and was kept a prisoner during the remaining twenty-eight years of his life. The acquisition of Normandy, the ancient patrimony of his family, had been a point of ambition with Henry; to hold it he was obliged to spend long periods away from his kingdom, and to wage a nearly constant warfare, supported largely by English arms and by subsidies wrung from his English subjects. The French king, Louis the Fat, and the Counts of Anjou and Flanders took part with William, Robert's youthful son; but the first war ended in the peace of Gisors (1113), on terms favourable to Henry; and in the following year his daughter Matilda was married to the Emperor Henry V. of Germany, and a new alliance thus formed. The second war (1116-20) was marked by the defeat of the French king at Noyon in 1119; and in the same year he presented a formal complaint to Calixtus II. at the Council of Rheims. Henry, however, was able in a personal interview to satisfy the pope, who succeeded in bringing about a peace. In 1119, also, Henry's only son, William, was married to the daughter of the Count of Anjou; but in 1120 he was drowned by the sinking of the White Ship on his way from Normandy to England, and Henry's successes in arms and intrigue were darkened for life. A fresh rebellion in Normandy ended in the battle of Bourgtheroulde (1124), and in cruel punishments inflicted on the principal prisoners taken. In 1126 Matilda, now a widow, came back from Germany; in the same year Henry induced the Witan to swear to receive her as Lady of England and Normandy if he should die without heirs-male; and before the year was out she was married to Geoffrey Plantagenet, the son of the Count of Anjou. In 1127 Robert's son William was put in possession of the vacant countship of Flanders; but in 1128 he died, and the wars between Henry and Louis ceased. Henry himself died on December 1, 1135, and the crown was seized by his sister Adela's son, Stephen of Blois.

Henry I. was styled Beauclerc, or the Scholar, in honour of his learning, which, for a king in his age, was not undeserving of distinction. Able he was, but crafty, passionless in his policy, and often guilty of acts of cold-blooded cruelty; yet he was at least consistent in his severity, unmoved by impulses such as, generally evil but sometimes good, had governed Rufus; and even his licentiousness was judged lightly after the foul vices of the Red King. Law was administered during his reign with strictness, and generally with fairness; the innocent might now and then be confounded with the guilty, and the penalties were often severe and barbarous enough, but, at the worst, only individuals suffered from his cruelty, while the great mass of his subjects reaped the blessings of his firm rule. Moreover, under the equal weight of his heavy hand, Normans and English were slowly compressed into one nation; and after the landing of Robert at Portsmouth in 1101, never again did the two races meet in arms face to face on English soil. 'Good man he was,' writes the chronicler, 'and mickle awe was of him. Durst none man misdo with other on his time. Peace he made for man and deer.'

See Freeman's *Norman Conquest*, vol. v. (1876); also Stubbs, *Constitutional History of England*, vol. i. (1874); and Dean Church's *Saint Anselm* (1870).

Henry II. of England, the first of the Angevin kings, was the son of Matilda, daughter of Henry I., and her second husband, Geoffrey Plantagenet, and was born at Le Mans, March 5, 1133. His mother, assisted by her illegitimate brother the Earl of Gloucester, had carried on a bitter war against Stephen, as a usurper, from 1139 to 1148. Henry himself, unable after his uncle's death to secure any powerful following, joined his father in Normandy. At eighteen he was invested with this duchy, his mother's heritage, and within a year after became also, by his father's death, Count of Anjou; while in 1152 his marriage with Eleanor of Aquitaine, the divorced wife of Louis VII., added Poitou and Guienne to his dominions, which now embraced nearly the whole of western France. In January 1153 he landed in England; and, after his and Stephen's armies had twice been face to face, a treaty was finally agreed to in November, whereby Henry was declared the successor of Stephen, whose son Eustace had died during the negotiations. Stephen died the next year; Henry was crowned on 19th December 1154, and issued a charter confirming his grandfather's laws. He at once re-established the machinery of the exchequer, banished the foreign mercenaries, demolished the hundreds of castles erected in Stephen's reign, and recovered the royal estates. The whole of the year 1156 the king spent in France, where he was employed until July in effecting the submission of his brother, Geoffrey of Nantes. Geoffrey died in 1158, and Henry, having secured his territories, spent five years warring and organising his possessions on the Continent, whence he returned in January 1163 to enter on the disastrous quarrel with the church that fills the second period of his reign.

Henry, like his grandfather, had come to the crown after an evil time of misgovernment and of anarchy, and his fame too is that of a lawgiver, the restorer of peace and order. His object was that of all the Norman kings—to build up the royal power at the expense of the feudal barons and of the church; but his policy, while selfish in its aim, was beneficent in result, inasmuch as he was wise enough to recognise that his power could be securely founded only on the well-being of the people. From the barons themselves his reforms met at the time with little serious opposition; with the clergy he was less successful. Not only could they use their weapon of excommunication with terrible effect, but, being tried by their own courts, they were not amenable to the common laws of the realm, and were protected from the punishment due to their crimes; so that thieves and murderers, calling themselves clerks, would for a first offence escape with penances and deprivation of orders. To aid him in reducing the church to subjection to the civil power he appointed his trusted chancellor, Becket, to the see of Canterbury. This was the great mistake of his life, for with his archbishop's pall Becket put on the spirit of the high ecclesiastic, and abandoned the king's service for the pope's. Henry compelled

him and the other prelates to agree to the 'Constitutions of Clarendon' (q.v.); but Becket proved a sturdy churchman, and the long and obstinate struggle between him and his monarch was only terminated by his murder (see BECKET). Henry was barely saved from excommunication by his messengers making for him an unreserved submission to the pope; but he was determined not to repeat their oath. At a later date (1174) he did penance at Becket's grave, allowing himself to be scourged by monks; but, though the 'Constitutions of Clarendon' were formally repealed, the king was ultimately successful in reducing the church to subordination in civil matters. Before Becket's death Henry had made three military expeditions into Wales, none of them, however, of any permanent effect; and, while negotiations were pending for his absolution, he organised an expedition to Ireland. The English pope, Adrian IV., had in 1155, by the famous bull *Laudabiliter*, given Henry authority over the entire island; and in 1167 a number of Norman-Welsh knights, having been called in to the aid of a banished king of Leinster, had gained a footing in the country. Others soon followed, among them, in 1170, Richard de Clare, afterwards nicknamed Strongbow, who married the heiress of Leinster, and in 1171 assumed rule as the Earl of Leinster. Henry was jealous of the rise of a powerful feudal baronage in Ireland, and during his stay there, from the autumn of 1171 to Easter 1172, while waiting for the arrival of the friendly legates from Rome, he secured the submission of kings and bishops, and left the power of Strongbow and the other nobles broken. For thirteen years his governors carried out his system of interference and persecution; and when in 1185 Prince John was appointed king of Ireland, he took with him a batch of Norman and French knights who pushed the soldiers of the first conquest aside. But before the end of 1186 John himself was driven from the country, and all was left in confusion.

The third period of Henry's reign is occupied with the rebellion of his sons. The eldest had died in childhood; the second, Henry, born in 1155, was crowned as his father's associate and successor in the kingdom in 1170, having been married at the age of five to the little princess Margaret of France. In 1173, incited by their jealous mother, Queen Eleanor, the prince and his brother Richard rebelled against their father, and their cause was espoused by the kings of France and Scotland. The latter, William the Lion, was ravaging the north of England with an army, when he was surprised at Alnwick, and taken prisoner, 12th July 1174. To obtain his liberty, he submitted to do homage to Henry for Scotland (see SCOTLAND; also EDWARD I.). By September 1174 Henry had defeated the great league thus formed against him, and re-established his authority in all his dominions. In the course of a second rebellion, Prince Henry died of a fever at the age of twenty-eight; and in 1185 Geoffrey, the next son, was killed in a tournament at Paris. At the end of 1188, while Henry was engaged in a war with Philip of France, Richard joined the French king; and in July, Henry, having lost the chief castles of Maine and the town of Le Mans, ill and broken in spirit, agreed to a treaty of peace, of which one of the stipulations was for an indemnity for all the followers of Richard. The sight of the name of his favourite son John in the list broke his heart; and he died at Chinon on 6th July 1189.

Upon the whole, Henry was an able and enlightened sovereign, a clear-headed, unprincipled politician, an able general. He did not use his power despotically; and such enemies as he could either win over or disable he spared. His reign was one of great legal reforms. With the exchequer the ancient office of the sheriffs was restored, the jury system was extended, circuit courts were established, and a high court of justice formed; whilst the institution of Scutage (q.v.) and the revival of the old Anglo-Saxon militia system did much to break the power of the great feudal lords. The earliest writer on English law, Ranulf de Glanvill (q.v.), was Henry's chief justiciary from 1180. He was ambitious for his children, but he used them so freely as counters in the great game of politics that he ultimately alienated whatever affection they had to give; yet, even so, he was sinned against deeply by both his wife and his sons. When not restrained by policy his temper was passionate and outrageous; and his personal vices were those of the first Henry. Fair Rosamond (see CLIFFORD) is commonly said to have had two sons by him, William Longsword, Earl of Salisbury, and Geoffrey, who became Archbishop of York, and who was faithful to him when his four legitimate sons took up arms against him. But there is no positive evidence that the former was her son; while Geoffrey's mother appears to have been a woman of degraded character, named Ykenai or Hikenai.

See Freeman; Stubbs, *Constitutional History*, and preface to vol. ii. of the *Chronicle of Benedict of Peterborough* (1867); and Mrs Green, *Henry the Second*, in 'Twelve English Statesmen' series (1888).

Henry III. of England, grandson of Henry II., and eldest son of King John, was born 1st October 1207, and succeeded to the throne on his father's death at the age of nine. His reign is one of the longest and most troubled in English history, and he himself one of its least attractive and least interesting figures. The first forty-two years are for the most part a dreary record of misgovernment and purposeless extravagance, the next seven a period of strife and civil war, the remainder of little interest. Henry was more devout than his predecessors, and could boast more domestic virtues; but he inherited his father's faithlessness, and through all his impolicy exhibited a stubborn determination to be at least as autocratic as he. The interest of the reign, however, centres not in the king, but in the birth and infancy of the English constitution. In 1227 Henry declared himself of age to govern; in 1232 he deprived Hubert de Burgh, who had ruled England well as regent, and as justiciary had practically continued to govern the country, of all his offices; and in 1234 he was compelled to dismiss Hubert's rival and successor, Peter des Roches. He took the administration into his own hands, and henceforward managed everything ill both at home and abroad. A war with France cost him Poitou, and might have cost him all his continental possessions, and even his own liberty, but for the generous disposition of the French king, Louis IX. In his boyhood, under the direction of the judicious Earl of Pembroke, he re-issued the Great Charter, though with certain important omissions; and he confirmed it more than once afterwards, but always as a condition of a money grant. He was beset with favourites, chiefly from the country of his queen, Eleanor of Provence, and he allowed exorbitant exactions on the part of the pope. His misrule and extortion roused all classes, and in 1258 the parliament, as the assembly of the barons and bishops was already called, headed by his brother-in-law, Simon de Montfort, Earl of Leicester, forced him to agree to the Provisions of Oxford (q.v.), whereby he transferred his power temporarily to a commission of barons. But jealousy and disunion among the barons soon enabled Henry to repudiate his oath, and after a brief period of open war (1263) the whole matter was referred to

the arbitration of Louis of France, who annulled the Provisions. De Montfort and his party disregarded their agreement to be bound by his judgment, and took up arms against the king. They defeated him, and took him prisoner in the battle of Lewes, on 14th May 1264. The battle was followed by an agreement called the Mise of Lewes (q.v.), more humiliating to the king than the Provisions of Oxford. Earl Simon now summoned the parliament (20th January 1265) which has since been famous as the first assembly of the sort in which boroughs were represented; although it was nearly the end of the century before the representatives of towns began regularly to sit in parliament. De Montfort's supremacy did not last long. Within a year the powerful Earl of Gloucester deserted his party, and, with Prince Edward, who had escaped from captivity, led an overwhelming army against him. Simon was defeated and slain at Evesham, on 4th August 1265. With this event the importance of this long, dismal reign ends. Henry died on 16th November 1272, and his son Edward, though absent in Palestine, was at once proclaimed king.

See Freeman, Stubbs (vol. ii.), Prothero's *Life and Times of Simon de Montfort* (1887), and other works cited at MONTFORT.

Henry IV. of England, the first king of the House of Lancaster, was born 3d April 1367, the son of John of Gaunt, and was surnamed Bolingbroke, from his birthplace in Lincolnshire. His father was the fourth son of Edward III., his mother the daughter of Duke Henry of Lancaster. In 1386 Henry was made Earl of Derby, and married Mary de Bohun, the second richest heiress in England. For some years he led a roving life. He was present at the taking of Tunis in 1390, fought against the heathen on the shores of the Baltic, made an attempt to reach Jerusalem in 1392–93, and commanded some English lances in the disastrous battle against the Turks at Nicopolis (1396). In 1397 he supported Richard II. in the revolution which destroyed the Duke of Gloucester, and was created Duke of Hereford; in 1398 he was banished, and in the following year, when his father died, his estates were declared forfeit to Richard. Thereupon, in July 1399, Henry landed in Yorkshire with three small vessels. He met with no opposition; and on September 29, in the Tower, he induced Richard, who had been deserted and betrayed, to sign a renunciation of his claims to be king. On the next day Henry rose in his place in parliament and claimed the kingdom and crown, all present assenting. The act was a usurpation, for Henry's claim to succeed by right of birth was barred by the six-year-old son of the Earl of March, who was descended from an older branch. Richard was shut up in the castle of Pomfret. There was an attempted rising on the part of his friends in the following January, but it was easily suppressed, the leaders being beheaded by the mob; and in the middle of January 1400 Richard died in his dungeon, probably from starvation. Yet his death was more than once denied by the disaffected party, and many cruel executions were necessary before the report that he had escaped to Scotland could be silenced. Henry's reign was one of trouble and commotion. There were incessant rebellions, and more than one treacherous attempt was made upon his life, until in his last years he was reduced to a state of constant fear. Lawlessness, rising partly out of the great poverty and heavy taxation, was rife in every quarter; piracy crippled commerce, though not much more so than the increased duties laid on staples; and frequent descents were made upon the coast by expeditions from France—for the country of Richard's young queen was Henry's implacable enemy. The king's movements, too, were constantly hampered for want of money, there being no funds available for anything beyond the most ordinary expenses of the country; and 'war treasurers' were ultimately appointed by the impatient Commons to watch the disbursement of the sums voted. In 1404 the Illiterate Parliament, to which it had been directed that no lawyer should be returned as a knight of the shire, proposed to confiscate the property of the clergy; but the necessity under which Henry found himself of supporting the authority of the church led him not only to discountenance all such proposals, but also to permit severe enactments against heretics. On 2d March 1401 the first case in England of burning for heresy occurred, when a clergyman named William Chatrys was burned at Smithfield.

The chief disturbances of the peace of the reign, however, were occasioned by the Welsh and the Scots. Under Owen Glendower (q.v.) the Welsh maintained their independence throughout this reign, and kept up a harassing warfare against the English. Scotland Henry invaded in 1400, besieging Edinburgh Castle until compelled by famine to retire. In 1402, while Henry was engaged against the Welsh, the Scots in turn made an irruption into Northumberland with 40,000 men; but a body of some 10,000 of them were encountered by the Earl of Northumberland and his son Harry Percy, with a force computed at 12,000 lances and 7000 archers, and met with a crushing defeat (14th September) at Humbleton (or Homildon), where Earl Douglas and the Duke of Albany's son were taken prisoners. Harry Percy (Hotspur) and his house shortly after broke with the king, and leagued with Douglas and Glendower against him; but the king met the Percies at Shrewsbury (21st July 1403), where the insurgents were utterly defeated, Hotspur slain, and Douglas again taken prisoner. Two other insurrections followed, but were easily suppressed; and the remainder of the reign was comparatively free from domestic troubles. In 1406 Prince James of Scotland (afterwards James I.) was captured on his way to France, and was detained and educated in England. The civil wars in France gave Henry an opportunity to send two expeditions (1411 and 1412) to that country; but in his later years he was a miserable invalid, afflicted with epileptic fits, the last of which seized him while in Westminster Abbey. He died on 20th March 1413, in the Jerusalem Chamber; and this was taken to explain a prophecy which had said that he was to die at Jerusalem—and as late as the preceding November he certainly had hoped to go once more on crusade. Henry's last days were embittered by a dread that he would be supplanted by his eldest son. He had commenced his reign energetic and determined to govern on constitutional principles; to this resolve he remained steadfast, as he maintained also his devoutness and purity of life; but disappointment and perhaps disease latterly made him cruel, vindictive, suspicious, and irresolute. The labour and sorrow of founding a dynasty were his, and his usurped crown he found a heavy burden.

See Stubbs, vol. iii.; Gairdner, *The Houses of Lancaster and York*, in 'Epochs of History' series (1874); and especially Wylie, *History of England under Henry the Fourth* (1884–98). To these must be added, for this and the next two reigns, and for Henry VIII., Shakespeare's historical plays, which are based mainly on the Chronicles of Hall and Holinshed (q.v.). For their value as history, see Courtenay's *Commentaries on the Historical Plays of Shakespeare* (2 vols. 1840).

Henry V. was born in the castle of Monmouth, 9th August 1387, the eldest of the six children of Henry IV. by Mary de Bohun, from whom he

inherited a certain taste for books. According to a local tradition, he studied for a time at Queen's College, Oxford, perhaps in 1399–1400. From 1401 we find him engaged against Glendower, and in 1403—the year of Shrewsbury, where he was wounded in the forehead by an arrow—he was appointed the king's lieutenant in Wales. Here he remained in command of operations until 1408, and succeeded at least in keeping Glendower behind the barriers of his mountains. In 1409 he became constable of Dover, and in 1410 captain of the town of Calais; and in one of these places, or in London, he resided until his father's death. The story of his committal to prison is a fiction (see GASCOIGNE), and may be traced to a passage in the life of Edward II. when Prince of Wales. There is some evidence that Henry was for a time not on good terms with his father; but the charges of riot and profligacy are at least gross exaggerations of a young soldier's harmless, boisterous frolics. He was crowned on 10th April 1413, and at the outset of his reign liberated the young Earl of March, who was the true heir to the crown, restored the son of Hotspur to the lands and honours which his father had lost by rebellion, and had Richard II.'s body brought up from Langley and buried in Westminster. The great effort of his reign was an attempted conquest of France, now ruled by an imbecile king and distracted by internal factions; and in 1414 Henry formally demanded the French crown, to which he seems to have believed sincerely that he had a valid claim, through his great-grandfather, Edward III. On 11th August 1415 he sailed with an army of 30,000 men, after crushing a conspiracy to carry off the Earl of March; and on 22d September he took Harfleur, after five weeks' siege, at a great cost of life, including 2000 men carried off by dysentery. On 8th October he set out on a march to Calais, and at Agincourt (q.v.), on the 25th, where his way was blocked by a French army, gained a battle against such enormous odds as to make his victory one of the most notable in history. Two years after he again invaded France, and by the end of 1418 Normandy was once more subject to the English crown. Henry's forces had appeared before the walls of Paris, when the murder of the Duke of Burgundy (10th September 1419) aroused the indignation of France against the dauphin, who had to withdraw beyond the Loire; and on 21st May 1420 was concluded the 'perpetual peace' of Troyes, under which Henry was recognised as regent and 'heir of France,' and received the French king's youngest daughter, Catharine, in marriage. In February 1421 he took his young queen to England to be crowned, having shown the same promise of just and vigorous rule as he had already done in Normandy; but in a month he was recalled by news of the defeat at Beaujé of his brother the Duke of Clarence, by a force consisting largely of Scotch, commanded by the Earl of Buchan. Henry returned to France for a third campaign, and his wonted success in arms was attending him, when he was seized with illness, and died at Vincennes on the 31st August 1422, at the age of thirty-five, leaving an infant to succeed him. Henry was a deeply devout prince, temperate, just, and pure of life; yet his religion, though he was free from wanton cruelty, did not make him merciful to a conquered enemy. He followed his father, too, though apparently with reluctance, in his treatment of the Lollards; even his old companion-in-arms, Sir John Oldcastle (q.v.), was sent to the stake. He was a brave soldier, a firm disciplinarian, a brilliant general; and he died when his fame was brightest.

See Stubbs; Gairdner, *Lancaster and York*; Nicolas, *History of the Battle of Agincourt* (1827); and A. J. Church, *Henry the Fifth* (1889), in the 'English Men of Action' series.

Henry VI., the only child of Henry V. and Catharine of France, was born at Windsor on 6th December 1421. As he was not quite nine months old when his father died, his uncle, John, Duke of Bedford, was appointed to govern France, and another uncle, Humphrey, Duke of Gloucester, to be protector of England in Bedford's absence, with a council appointed by parliament to aid and control him, the parliament declining to appoint him regent, though the late king had desired it. After twenty-four years' captivity, the Scotch king, James I., was set at liberty in the hope of securing peace on the northern border. In France, the incapable Charles VI. having died, his son the dauphin assumed the title of Charles VII., and went on fighting with the English. His army, commanded by the Scottish Earl of Buchan, now constable of France, was almost annihilated by the English at Verneuil (1424). But this victory was the last great success obtained by the English in France, and their power, which could only be maintained by force, gradually crumbled away. Gloucester's marriage with Jacqueline of Hainault (1423) during the life of her husband, John of Brabant, had strained the alliance with Burgundy, which soon after lost its strongest link by the death of Bedford's wife, Duke Philip's sister, in 1432. In 1429 the siege of Orleans was raised by the French, inspired by Joan of Arc (q.v.); and after this the English power declined steadily, in spite of their having burned Joan as a witch in 1431. Henry was crowned king of England at Westminster in 1429, and king of France at Paris in 1431; but the struggle, though continued for twenty years, was seen to be desperate. Bedford, the only great and statesmanlike leader on the English side, died in 1435; Paris was recovered by the dauphin in the following year; Normandy was completely lost by the fall of Cherbourg in 1450; and ultimately, in 1453, the English were expelled from all France (Calais excepted), greatly to the true advantage of both countries.

Disputes between Gloucester and his uncle, Cardinal Beaufort (q.v.), the powerful Bishop of Winchester, as well as war with France, prevailed during the king's minority. Besides being bodily weak, Henry inherited the mental infirmity of his grandfather, Charles VI. of France. In 1445 a wife was found for him in the strong-minded Margaret of Anjou; and in 1447 the Winchester party, supported by her, succeeded in having Gloucester arrested for high-treason. Five days later he was found dead in his bed; but that he was murdered there is no proof, and such evidence as we have tends to the opposite belief. Beaufort, who had served the state faithfully for fifty years, survived his nephew only six weeks, and after his death everything went wrong. The want of strength in the king, as well as in his title to the crown, was an invitation to every form of faction to display itself. Jack Cade (q.v.), an Irish adventurer who pretended to be a Mortimer, obtained a temporary possession of London; but the citizens overcame him and his pillaging followers, and he was killed in Sussex. The true representative of the Mortimers was Richard, Duke of York, and he was one of the unquiet spirits of the reign. As a descendant of Lionel, Duke of Clarence, the third son of Edward III., his title to the crown was superior to that of the king, who was descended from the Duke of Lancaster, the fourth son of that monarch, and he laid claim to the crown with more or less openness, according to circumstances. His influence and address were so great that in 1454, on the occasion of

the king's weak mind being entirely eclipsed, he was appointed protector by parliament. On the king's recovery he was indisposed to give up his power, and levied an army to maintain it. On 22d May 1455 the first battle of St Albans was fought, and the Yorkists were victors; the Duke of Somerset, the queen's favourite minister for the time, was slain, and the king himself was taken prisoner. This was the first battle of twelve that were fought between the Houses of York and Lancaster in the Wars of the Roses (for an account of the struggle, see Roses, Wars of the; see also Edward IV.). A return of Henry's disorder made York again protector in 1455–56; and on his recovery the poor king vainly strove to maintain peace between the duke's faction and the queen's. Margaret headed the Lancastrian forces, and never relinquished the struggle; but in 1461 Edward IV. was proclaimed king, and in 1465 Henry was captured and committed to the Tower. In 1470 Warwick restored him to the throne, but six months after he was again in Edward's hands; and at Tewkesbury (4th May 1471) his son was slain and Margaret taken prisoner. Edward returned to London on the 21st May; and that night Henry was murdered in the Tower. Margaret was ransomed by Louis XI. in 1475, and returned to France. Henry had lost both the kingdoms to which he had succeeded, and seen all his friends die vainly for his sake. The most unfortunate of kings, his reign stands out in English history as one long disaster. He himself was a just and merciful prince, pious, pure, and generous; but the gentle and saintly scholar, with his fits of imbecility, was no fit monarch for times so rough. His highest claim on our gratitude is that he founded Eton College and King's College, Cambridge.

See Stubbs; Gairdner's *Lancaster and York*, and his introduction to the *Paston Letters* (vol. i. 1872).

Henry VII., founder of the Tudor dynasty, was born at Pembroke Castle, the seat of his uncle, the Earl of Pembroke, on January 28, 1457. His father, Edmund Tudor, was the son of Owen Tudor, a knight of Wales, and of his wife, Queen Catharine, the widow of Henry V.; he had been created Earl of Richmond by his half-brother, Henry VI., and died before his son's birth. His mother, Margaret Beaufort, was the lineal representative of the House of Lancaster, being descended from John of Gaunt and Catharine Swinford, whose children were legitimated after their marriage. The young Earl of Richmond was thus the nearest heir, after Richard III. had murdered his nephews, the sons of Edward IV., except their sisters and Richard himself. After Tewkesbury he found asylum in Brittany, until he was invited to invade England and rescue it from the usurper. The first attempt (1483) ended in failure, and cost the Duke of Buckingham his head; but in August 1485 Richmond landed at Milford Haven, and marched across the country to Bosworth, in Leicestershire, where Richard was defeated and slain. Henry now ascended the throne; and his marriage with Elizabeth of York, Edward IV.'s eldest daughter, by which the White Rose and the Red were united, was celebrated in the following January. His reign was troubled by several impostors claiming the crown: first, Lambert Simnel, an Oxford joiner's son, who professed to be the Earl of Warwick, Clarence's son, and was proclaimed king in Ireland, but was defeated at Stoke in 1487, taken prisoner, and turned into a menial in the king's kitchen; next, Perkin Warbeck, who pretended to be the boy Duke of York, who had *not* been murdered in the Tower by Richard III., and was patronised by the Duchess of Burgundy and supported by the Emperor Maximilian and James IV. of Scotland, but was finally captured in 1497; and finally, Ralph Wilford, who also pretended to be the Earl of Warwick, but did not succeed in carrying his enterprise far, being almost at once taken and hanged in 1499. In this year Henry, to end his troubles from pretenders, had Warbeck, whom he had pardoned, and the true Earl of Warwick, a youth who had known only captivity all his days, convicted of a plot to recover their liberty, and executed. The execution of the latter is the chief blot on Henry's memory; for the execution of Sir William Stanley, deeply though the king had been indebted to him, there appears to have been ample justification.

In 1492 Henry invaded France, but was bought off with a promise of 745,000 crowns; and this was the only foreign war in which he engaged, although his successful diplomacy gave him an influence in continental politics greater than had been attained by any king of England before him. Ferdinand and Isabella's daughter, Catharine of Aragon, was married to his son Arthur, Prince of Wales, a boy of fifteen, just before he died; and Henry's policy, added to an objection to return part of her dowry, ultimately led him to betroth her to his next son, who became Henry VIII. A marriage from which flowed most important consequences was that of his eldest daughter, Margaret, to James IV. of Scotland, which a century later brought about the union of the crowns. In February 1503 Henry's queen died, and in his active endeavours to obtain a second wife, with a sufficiently large dowry, he proposed a few months later to marry his own daughter-in-law, Catharine, who had been left a widow by Arthur the year before; and in 1506 he even offered to wed her sister Juana, the insane heiress of Castile. With similar projects he was still engaged when he died on April 22, 1509, leaving behind him £1,800,000, worth £18,000,000 in our currency. He was a lover of peace, the friend of the church, the patron of scholarship and architecture, as well as of commerce and adventure. Bacon calls him 'a wonder for wise men,' and 'this English Solomon, for Solomon also was too heavy upon his people in exactions.' But Henry's avarice has been exaggerated. Chiefly he was a financier, yet his legislation was wise and just. He not only ruled, but governed England, and under him the country prospered and the trading-class became more powerful; the taxation was probably not so excessive as has been assumed, and the notorious extortions of the king's lawyers, Dudley and Empson (q.v.), did not touch the great mass of the people. Nor was the king greedy of gold for its own sake; 'to him,' says Gairdner, 'a large reserve was a great guarantee for peace and security.' As a politician Henry was pitted against such cunning opponents as Ferdinand of Spain, and at least matched them all in subtlety and in foresight; and the throne which he had won he left to his son stable and secure.

See Bacon's *History of Henry VII.*; Gairdner's *Henry the Seventh* ('English Statesmen' series, 1889); and Busch's *England under the Tudors* (vol. i. trans. 1895).

Henry VIII., the second of the Tudor monarchs of England, was born in 1491, and ascended the throne in 1509. He was the second son of Henry VII. and Elizabeth of York, and thus united the rival claims of the Houses of York and Lancaster. Previous to the death of his elder brother Henry had been intended for the church; and this early bent of his mind must in some measure explain his life-long interest in all matters of religious faith and church government. During the first years of his reign Henry held a place in the hearts of his people such as no English monarch before or since has ever held. This affectionate admiration, which with strangely little diminution

he retained to the last, was due to the fact that of all English kings he was the most intensely English—mentally, morally, and physically. This enthusiasm of his people was also the natural rebound of feeling after the tame and cautious government of Henry VII., a king, in spite of all his admirable qualities, the last in the world to give rise to any such enthusiasm himself. In his earlier manhood Henry was accounted the handsomest prince of his time, though foreign observers declared that his contemporary, Francis I., bore himself with a more kingly air. In all manly exercises he could hold his own with any of his subjects. His attainments and general mental cultivation were far beyond those of his great rivals, Francis and the Emperor Charles V.; and his accession to the throne was hailed with delight by such men as Colet, Erasmus, and More, as the happiest omen for the new studies which had lately found their way into England.

At the date when Henry ascended the throne of England a ruler was needed with an energy of character and force of intelligence such as had never yet been required of any English prince. With the reign of Henry VIII. begins the modern period of European history. The beginning of the new time was marked by many circumstances that broadly distinguish it from the age that preceded it. In Henry's reign began that relation of the leading powers of Europe to each other which has continued to the present day—a relation of jealous watchfulness, that insists on a 'balance of power' as the necessary condition of the integrity of each separate state. To play his part in the new order, therefore, a range of policy was required of Henry far beyond that of even his most ambitious predecessors. In home affairs, also, questions were thrust upon him which touched the very existence of the nation. By the Wars of the Roses and the policy of Henry VII. the strength of the feudal barons had been broken, and the modern middle class had begun to be a force in the state. Had Henry been a weak ruler, however, there was still sufficient power left in the old aristocracy to have effected at least a temporary reaction, and to have revived the disasters of the late civil wars. Above all the new time was marked by a revolutionary spirit in all questions of religion that strained to the utmost the prudence of Henry and other contemporary princes. In Henry's reign the followers of Luther found their way into all the leading countries of Europe, and by their uncompromising zeal gave the most serious alarm to the upholders of the old order. By the rise of the great rival powers, also, and by his own diminished prestige, the pope and his claims had become a question of the first political importance—a question that affected the entire development of the respective states of Europe. The question of the papal supremacy presented itself to Henry in a special form, but sooner or later it must have presented itself in one form or another, and sooner or later been decided as Henry decided it. It was impossible that the question should not arise whether certain outgrown institutions and privileges should continue in the interest of a foreign potentate, who by the very condition of his existence was now at the bidding of whatever ruler might chance to have the strongest arm. The time, in short, was one when revolutionary forces were everywhere at work; and it is only by keeping this fact before us that we can form any real conception of the most extraordinary reign in English annals.

Shortly after his accession Henry, by the advice of his council, married Catharine of Aragon, his brother Arthur's widow—a step, as it turned out, of tremendous consequence in the destinies of England. The first three years of the reign passed without any memorable event. At home, by a succession of shows and festivities, Henry at once gratified his own taste for pleasure and gained an easy popularity with his people. He also gave further satisfaction by the execution of Dudley and Empson. In 1512 the real history of Henry's reign begins. As a member of the Holy League, formed by the pope (Julius II.) and Ferdinand of Spain against Louis XII., Henry in that year began his first war by the invasion of France. The result was far from encouraging. Overreached by Ferdinand, Henry sent a body of troops to Spain, who disgraced England in the eyes of Europe by mutinying against their leaders, and insisting on being led home without striking an effective blow. The next year Henry invaded France in person, and partly retrieved the national honour at the so-called Battle of Spurs, and by the capture of Terouenne and Tournay. During his absence a greater triumph was gained for England by the disastrous defeat of the Scots at Flodden, which for several years left Henry a freer hand to carry out his continental policy.

It was in this first French war that Henry's great minister, Wolsey, began to take a prominent place in the councils of the nation; and thenceforward till his fall in 1529 the history of this reign is little else than the history of Wolsey. A servant of Henry VII., Wolsey had early ingratiated himself with his son at once by his pliant courtliness and his consummate ability in public affairs. So early as 1514 Wolsey was after the king himself the first man in the country. During the sixteen years of his administration the history of England is the history of its foreign policy. In this policy the chief aim of Wolsey and his master (for Henry even at his most thoughtless period never wholly neglected public business) was to hold in equipoise the two great continental powers, France and Spain, and by maintaining the position of arbiter to win for England an importance to which her own resources hardly entitled her. In pursuance of this aim the support of England was till 1525 given to Spain against France. In this first period of the reign the foreign events on which the most important consequences turned were the election of the emperor in 1519, the battle of Pavia in 1525, and the sack of Rome in 1527.

From the election of Charles of Spain to the empire over Francis I. of France began that rivalry between these two princes which for a quarter of a century distracted western Europe with almost continuous war. It was of the utmost importance both to Charles and Francis what side Henry should take in the duel they saw before them. Both, accordingly, were eager in their proffers of friendship to the English king. At the *Field of the Cloth of Gold*, near Guisnes, in the English dominion in France, where Henry and Francis met in 1520 amid a blaze of grandeur that sorely drained the purses of both nations, a meeting took place, which, after many professions of friendship, came to nothing. Henry had hardly left Francis when he met the emperor at Gravelines, where a formal alliance between them was confirmed by the betrothal of Charles to Henry's daughter Mary, then a child of four years. The protracted struggle between Charles and Francis at once began, though the following year (1521), at Calais, Wolsey did his utmost as ambassador of England to maintain the peace of Europe. The struggle proceeded with varying success till in 1525, at the battle of Pavia, Francis was brought to the verge of ruin by his own capture and the defeat of the most powerful army he had ever led into Italy. As the ascendency thus gained by the emperor endangered that balance of power at which Wolsey was ever aiming, England was now thrown into alliance with France. The sack of Rome by the emperor's troops in 1527

supplied Henry with still stronger reasons for joining France; and meanwhile domestic reasons were urging him in the same direction.

The leading events at home during these sixteen years may be briefly told. In 1521 the Duke of Buckingham, a descendant in the female line from the youngest son of Edward III., and, therefore, a possible claimant for the throne, was executed on a charge of treason. There was little foundation for the charge; but the death of this great noble man showed England that Henry, in spite of all his love of pleasure, was no ruler to be trifled with, while it gave continental princes a strong impression of his unlimited power over his subjects. The same year Henry published his famous book on the Sacraments in reply to Luther, and received from Pope Leo X. the title borne by all Henry's successors—*Fidei Defensor*, 'Defender of the Faith.' To enable him to play that part in continental affairs which he desired, Henry had frequent need of supplies beyond any of his predecessors. To raise these supplies Wolsey showed his devotion to the king by taking upon himself all the odium of frequent and excessive taxation. In 1523 he demanded of the House of Commons a subsidy of £800,000, to be raised by a tax of twenty per cent. on all goods and lands. After a vigorous protest by the house Wolsey carried his point; but the resistance he had met was a serious warning that there were limits beyond which even he could not safely proceed. To the country at large he made himself still further odious by the suppression of all monasteries with less than seven inmates. As he devoted the revenues of these monasteries to educational purposes, this action was in the best interests of the country; but the monks were still popular, and the people were not yet prepared for this high-handed dealing with a time-honoured institution. In 1525 Henry's expensive foreign policy again brought him into straits for money, and again Wolsey had to face popular feeling by the proposal of an illegal tax. The tax he now proposed is known as the Amicable Loan. On all sides it met with the strongest opposition, and Wolsey was forced to abandon his proposal, but 'people cursed the cardinal and his adherents as subversive of the laws and liberty of England.'

The turning-point in Henry's reign, as it is a great turning-point in the history of England, is the moment when the thought first occurred to him that at all costs his marriage with Catharine of Aragon must be dissolved. In taking a step which he knew to be fraught with the most far-reaching consequences to the nation Henry was determined by so many motives that it is hopeless to decide which at any one period carried it over the rest. Catharine was plain in personal appearance, cold by her natural temper, and six years older than her husband; all her children, except her daughter Mary, had died in infancy, and Henry professed (and we may believe honestly enough) to see in this the judgment of heaven on an unnatural alliance; any doubt of the legitimacy of Mary might lead to a renewal of the civil wars of the preceding century; the interest of England seemed now to point to France rather than Spain as her most advantageous ally, and Catharine did not conceal her disapproval of Henry's breach with her cousin the Emperor Charles; and, lastly, Henry had set his affections on another, Anne Boleyn, a niece of the Duke of Norfolk, who soon perceived the ascendency she had gained, and knew how to use it for her own purpose. With such various motives behind him, Henry, with all the passionate self-will of his nature, bent himself to accomplish his end. Pope Clement VII., who after the sack of Rome had every reason to dread and detest the influence of the emperor, was at first disposed to humour Henry's desire for a divorce, and in 1528 sent Cardinal Campeggio to England to try the validity of the king's marriage with Catharine. The visit of Campeggio, whose powers had been carefully guarded, settled nothing; and the pope under pressure from the emperor revoked the case to the Roman curia. This impotent conclusion was the ruin of Wolsey, who now found himself without a friend at home or abroad. The king blamed him for the failure of Campeggio's mission; Anne Boleyn, who was now all-powerful, looked on him as the only obstacle in the way of her ambition; and Catharine regarded him as the evil counsellor, who in his policy of opposition to the emperor was the main cause of all her misfortunes. In 1529, on an indictment for breach of *præmunire*, he was stripped of all his goods and honours, and dismissed from the court in disgrace. The next year he was summoned to London on a charge of high-treason, but broken in health and spirit died on the way, professing to the last his devotion to the king. 'No statesman of such eminence,' it has been said, 'ever died less lamented.' The people, who could not appreciate what he had done for England abroad in making her a power to be reckoned with in all the councils of Europe, saw in him only the haughty and vainglorious upstart, whose entire mode of life gave the lie to his office and profession.

The period from the fall of Wolsey to the fall of his successor, Thomas Cromwell, in 1540, is perhaps the most extraordinary, as it is, perhaps, one of the most important in all English history. During these years were broken link by link all the ties that bound England to the Papacy, and the country disparted from that system of the nations which men had come to regard as no less divinely ordered than the system of the heavens itself.

This severance of England from Rome was carried through by the parliament of 1529–36, summoned after an interval of seven years, and largely composed of the creatures of the king. Despite the coldness of the pope, Henry was as determined as ever on his divorce, and equally determined that he would not plead his cause at Rome, which would have been a direct admission of the papal supremacy. By way of relieving the scruples of the pope to reverse the judgment of his predecessors in favour of Henry's marriage, the case was submitted to the various universities of Europe. Their verdict was not unanimous, but the majority declared that Henry's scruples were justified. The pope, however, with the fear of the emperor ever before him, would not be moved from his position; and, meanwhile, the English parliament, inspired by the king, proceeded with its work. By humbling the clergy Henry doubtless thought he would be most likely to bring the pope to terms. Accordingly, one blow after another was struck at their privileges till they were taught that their real master was not the pope of Rome, but the king of England. In 1531 the whole body of the clergy, on the same grounds as Wolsey, were declared guilty of treason under the law of *præmunire*, and purchased the pardon of the crown only by the payment of £118,840. The same year he extorted from them his recognition as 'protector and supreme head of the church and clergy of England,' and the year following abolished the system of *annates* by which the pope received the first year's income of all newly-appointed bishops and archbishops. The tendency of all these acts could not be mistaken, and Sir Thomas More, who had succeeded Wolsey in the chancellorship, and who saw the inevitable end of Henry's policy, prayed to be relieved of the Great Seal. In further defiance of Rome, Henry (1533) was privately married to Anne Boleyn, in the teeth, also, as it

would appear, of public opinion, which all through had been on the side of Catharine. The year 1534 saw the definitive breach of England with Rome. By the parliament of that year it was enacted that all bishops should be appointed by a *congé d'élire* from the crown, and that all recourse to the bishop of Rome should be regarded as illegal. It was also enacted that the king's marriage with Catharine was invalid, that the succession to the crown should lie with the issue of Henry's marriage with Anne Boleyn, and that the king was the sole supreme head of the church of England. To this last act Bishop Fisher and Sir Thomas More, both men of the old order, but illustrious by their character and attainments, refused to swear, and both were executed the following year. In all his action against Rome Henry was eager that the world should understand that his quarrel was solely with the pope, and not with the doctrines of the church. The supporters of Luther, therefore, were treated with the same severity as the clergy of the old church who refused to acknowledge him in the place of the pope. To proclaim his soundness of doctrine he ordered (1537) the publication of the *Bishop's Book* or the *Institution of a Christian Man*, in which, with the exception of the headship of the pope, all the Catholic doctrines were set down after the strictest orthodoxy. It was the same anxiety to save his orthodoxy that prompted the famous *Statute of the Six Articles*, known as the *Bloody Statute*, in which all the fundamental doctrines of the Church of Rome are insisted on as necessary articles of belief—the severest penalties being attached to the denial of any one of them (1539).

In 1535, following the example of Wolsey, Henry appointed a commission under the direction of Thomas Cromwell to prepare a report on the state of the monasteries for the guidance of parliament. The report, contained in what is known as the *Black Book*, revealed a state of things that justified the most drastic dealing. The commissioners were strongly disposed to exaggerate whatever evils they found, and their report is to be taken for what it is worth; yet there is abundant testimony from friends and foes alike to prove that the monasteries had outlived their function, and that their general character was fitted to depress rather than elevate the moral ideal of the nation. On the strength of this report an act was passed for the suppression of all monasteries with a revenue under £200 a year. This high-handed dealing with an ancient institution brought to a head a widespread discontent with the late policy of Henry. In the north of England, especially, the sympathies of the people were mainly with the old religion, and the barons and country gentlemen were generally of the same way of thinking. The people, moreover, had a real grievance in the fact that everywhere there was much misery in the country, by reason of the land being extensively converted from agricultural to pastoral purposes, and its being bought up by speculators from the towns. The year following the suppression of the smaller monasteries, therefore, a formidable insurrection, known as the *Pilgrimage of Grace*, was organised in the northern counties under the leadership of a barrister named Robert Aske. The revolt was crushed and failed in all its objects, for the very next year Henry gave a final blow to the ancient church by the suppression of all the remaining monasteries. Henry's agent in this wholesale dissolution was Thomas Cromwell, the 'Hammer of the Monks,' who, after the king himself, was now the most powerful man in England. The removal of the monasteries was in the best interest of the country; but the manner in which Cromwell carried out the work is a revelation at once of the character of the man and the time. The revenues of the monasteries to the amount of £161,100 were devoted to small pensions for the abbots and priors, and the erection of six new bishoprics. The bulk of the revenues, however, passed to the crown and to those who had made themselves useful to the king.

We have again to return to the history of the king's marriages, which, in every case, it is to be remembered, have a more or less direct bearing on the policy of the reign. In 1536 Queen Catharine died, and the same year Anne Boleyn herself was executed in the Tower on the charge of infidelity to the king. The very day before her execution Henry was married to Jane Seymour, the only one of his wives for whom he appears to have had any real affection and respect. The next year Jane Seymour died, leaving a son, afterwards Edward VI. The succession being in the estimation of Henry and his ministers still insecure, Anne of Cleves was chosen as the king's fourth wife, in the hope of attaching the Protestant interest of Germany. Anne's personal appearance proved so little to Henry's taste that he consented to the marriage only on condition that a divorce should follow as speedily as decency would permit. Henry's disgust with Anne of Cleves was the immediate occasion of the ruin of his great minister Cromwell. As the agent of Henry's own religious policy Cromwell had made himself as generally detested as his predecessor Wolsey. It was mainly through his action that Anne had been brought forward, and his enemies used the opportunity of Henry's indignation to effect his ruin. Accused of high-treason by the Duke of Norfolk, he was executed on a bill of attainder, without the form of a trial (1540). On the day of Cromwell's death Henry married Catharine Howard, another niece of the Duke of Norfolk, and thus seemed to lend himself to the Catholic party represented by that nobleman. Before two years had passed Catharine suffered the same fate as Anne Boleyn, on the same charge, and in her case proved beyond dispute. In July 1543 Henry married his sixth and last wife, Catharine Parr, widow of Lord Latimer, a woman of character, who was happy enough to survive her husband.

During all these years the rivalry of Francis and the emperor had been the source of almost constant war, and Henry's interest in their struggle had been kept continually alive by the intrigues of France in Scotland. In 1543 Henry and Charles made a common invasion of France, which ended disgracefully for England by Francis and the emperor arranging a peace in which Henry's name was not even mentioned. In 1545 Francis made an abortive invasion of England, and the following year Henry retaliated by another invasion of France. At length, both monarchs being alike broken in health and spirit, they concluded a peace (1546), of which, by Francis's intervention, Scotland also had the benefit.

In his last years Henry suffered much from an ulcer in his leg, which seems at times to have goaded almost to madness a temper never very tractable or uniform. The execution of the young Earl of Surrey, son of the Duke of Norfolk, on a charge of high-treason, completes the long list of the judicial murders of Henry's reign. Norfolk himself was saved from the same fate only by the death of Henry himself, January 28, 1547.

From the revolting record of his conjugal relations and the long list of noble victims that make his rule a veritable reign of terror, Henry is apt to be hastily judged simply as an unnatural monster, borne along by motives of cruelty and lust. Yet it cannot be questioned that from first to last he was popular with all ranks of his people, and that

he inspired the most devoted affection of those in immediate contact with him. 'Had Henry been the wilful, capricious, and self-indulgent monarch he is sometimes represented,' says Professor Brewer, 'the intense personal devotion of such men as Wolsey, Cromwell, More, Gardiner, and Fitzwilliam, so unlike each other in all respects, this one excepted, would have been the most unintelligible paradox in history.' In the point of personal morals Henry was purity itself compared with his contemporaries Francis and James V. of Scotland. In the sense of kingly responsibility, also, he bears the most favourable comparison with the French king. Even in the shedding of blood Henry was merciful compared with Francis. In the case of the victims of the Bloody Statute, and even in the case of the deaths of such men as More and Fisher, we are bound to admit that Henry had a certain justification in principle and in the interest of the country. But in the wholesale massacre of the Protestants by Francis we have simply the gratuitous act of a monarch devoid himself of all religious conviction, prompted by the momentary caprice of selfish interest. Only a prince of the most imperious will could have effected the ecclesiastical revolution that makes Henry's reign perhaps the most important in English history. At the same time, the whole past policy of England towards Rome had its necessary result in Henry's rejection of his papal supremacy. By the law of *præmunire* the power of the pope had ceased to be more than a form, and it only required an occasion such as the divorce of Catharine, and a king with the resolution of Henry, to snap the bond that was already worn to the extremest tenuity. In the suppression of the monasteries, also, Henry in reality acted in accordance with the highest consciousness of the nation. The mass of the people were unfavourable to the revolution, but that section of the community which represented the moral sense of the nation was all on the side of Henry. It is in his manner of carrying out what was a necessary revolution, in his coarseness of nature, which deserves the harsher name of sheer brutality, that the instinctive feeling of revulsion against Henry finds its real justification.

See the articles Wolsey, Cromwell, More, Cranmer, &c.; Froude's *History of England* (vols. i.-xi.); *The Reign of Henry VIII., from his Accession to the Death of Wolsey*, by J. S. Brewer, edited by J. Gairdner (2 vols. 1884) from the prefaces to the Rolls publications; Mandell Creighton's *Cardinal Wolsey* (1888); Stubbs's *Lectures on Mediæval and Modern History* (1887); and Gasquet's *Dissolution of the English Monasteries* (2 vols. 1889).

Henry, Prince of Wales. See James I.

Henry, surnamed The Lion (1129–1195), Duke of Saxony and Bavaria, was the son of Henry the Proud, and the head of the Guelphs. After Bavaria, which had been taken from his father, was restored to him (1154) by the Emperor Frederick I., he became the most powerful noble in Germany, his possessions extending from the North Sea and the Baltic to the shores of the Adriatic. His great power and his ambitious designs roused against him a league of princes, ecclesiastical and temporal, in 1166; but Henry, with the emperor's countenance, was able to make head successfully against his enemies. Frederick I. at length grew alarmed, deprived Henry of his dominions and placed him under the ban of the empire in 1180. Nor was he fully reconciled to Frederick's successor, Henry VI., until about three years before his own death. Henry the Lion pursued an enlightened policy in ruling his dominions, in that he encouraged agriculture and trade; he fostered the commerce of Hamburg and Lübeck, and was the founder of Munich.

Henry III., emperor of Germany, only son of the Emperor Conrad II., was born on 28th October 1017, elected king of the Germans in 1026, Duke of Bavaria in 1027, Duke of Swabia in 1038, and succeeded his father as emperor in 1039. A man of stern though pious disposition, he resolutely maintained the imperial prerogatives of power, and encouraged the efforts of the Clugniac monks to reform the ecclesiastical system of Europe. Having summoned a council at Sutri in 1046, he put an end to the scandalous intrigues of the rival popes, Benedict IX., Sylvester III., and Gregory IV., by deposing all three and securing the election of Clement II. in their stead. In 1042 he compelled the Duke of Bohemia to acknowledge himself a vassal of the empire. The outcome of repeated campaigns in Hungary was the establishment of the supremacy of the empire over that kingdom in 1044. Henry also stretched his authority over the Norman conquerors of Apulia and Calabria. He died suddenly at Bodfeld, in the Harz country, on 5th October 1056. He was a zealous promoter of learning and the arts, especially music. He founded numerous monastic schools, over which he placed learned monks of Brittany, and built several churches, including the cathedrals of Worms, Mainz, and Spires, in the last of which he was buried. See Steindorff, *Jahrbücher des Deutschen Reichs unter Heinrich III.* (1874–81).

Henry IV., emperor of Germany, was born at Goslar on 11th November 1050, elected king of the Germans in 1054, and succeeded his father, Henry III., in 1056, his mother being named regent of the empire. She was soon ousted by the Archbishop of Cologne, and he in turn by the Archbishop of Bremen. About 1070 Henry began to act for himself. His first care was to break the power of the nobles of the land; but his measures provoked a rising of the Saxons, who in 1074 forced upon Henry humiliating terms of pacification. In the following year he defeated them in a great battle at Hohenburg, and then proceeded to take vengeance upon the princes, secular and ecclesiastical, who had ventured to contest power with him. The case of the latter gave the pope, Gregory VII., the pretext he longed for to interfere in the affairs of Germany. This was the beginning of the great duel between pope and emperor which has been already recorded under Gregory VII. (q.v.). This conflict between the representatives of secular and ecclesiastical power was marked by several dramatic events. In 1076 Henry declared the pontiff deposed. Gregory VII. retaliated by excommunicating Henry and absolving his subjects from all obedience to him. The king, seeing his vassals and princes gradually falling away from their allegiance, hastened, in midwinter, to Italy to make submission to the pope. For three days in January 1077 he was compelled to stand in the courtyard of the castle of Canossa, exposed to the inclemency of the weather, barefooted, and clothed only in the haircloth shirt of a penitent, before the pontiff consented to remove the ban of excommunication. Then, having found adherents among the Lombards, Henry renewed the conflict, but was again excommunicated. His counter-move to this was to appoint a new pope, Clement III., and to hasten over the Alps and lay siege to Rome. Henry in 1084 got possession of the city and caused himself to be crowned emperor by the antipope. Gregory, who had taken refuge in the castle of San Angelo, was only saved by the approach of Robert Guiscard at the head of the Italian and Sicilian Normans. In Germany, during Henry's long absence in Italy, three rival kings of the Germans successively found support amongst the princes. But Henry managed to triumph over them all. Crossing the Alps for the third time, he in 1090 restored the fortunes of his

friend, Clement III., took Mantua, and was rapidly subduing the Guelphic princes and their pope, Urban II., second successor to Gregory, who had died in 1085, when he learned that his son Conrad had joined his enemies and been crowned king at Monza. The wearied monarch, disheartened by this adverse blow, retired to one of his Lombard castles, and abandoned himself to despair. But at length rousing himself from his lethargy, he returned (1097) to Germany. His second son, Henry, was elected king of the Germans and heir to the empire. This prince, however, was induced to rise against his father by Pope Pascal II.; he took the emperor prisoner, and compelled him to abdicate. The emperor escaped from his prison, and found friends and safety at Liège, where he died, August 7, 1106. Henry deserved praise for the endurance and tenacity with which he struggled against the tremendous odds arrayed in opposition to him. That he was able to stand his ground at all, considering the magnitude of the task he took in hand—to break the overweening power of the great feudal nobles of Germany and to withstand papal aggressiveness incorporated in the person of a Gregory VII.—must be reckoned success of no mean character. See Floto, *Heinrich IV. und sein Zeitalter* (2 vols. 1855–57); Giesebrecht, *Geschichte der Deutschen Kaiserzeit* (vol. iii. 4th ed. 1876); and Minckwitz, *Die Busse Heinrichs des IVten* (2d ed. 1875).

Henry II., king of France, was born at St Germain on 31st March 1519, was married to Catharine de' Medici in 1533, and succeeded his father, Francis I., in 1547. Although an ambitious and stout-hearted prince, Henry suffered himself to be influenced by favourites, women mostly (such as Diana of Poitiers, q.v.). Immediately after his accession he proclaimed himself of the Catholic party, and proceeded to oppress his Protestant subjects. Through the influence of the Guises, whose sister, the dowager-queen of James V. of Scotland, sought the aid of France to support her against the English government, Henry formed an alliance with Scotland, and declared war against England, which ended in 1558 with the taking of Calais, after that city had been 210 years in the hands of the English. In spite of his Catholic proclivities, ambition made him renew the duel with the empire that his father had begun. In 1552 he concluded treaties of alliance with the German Reformers, and sent an army to aid Maurice of Saxony against the emperor. His troops captured Toul and Verdun, while Montmorency seized upon Metz. After a lull in the hostilities war was renewed in 1556. In the following year Guise's design to conquer Naples was frustrated by the generalship of Alva, whilst in the Low Countries the French under Montmorency sustained a crushing defeat at St Quentin. These reverses were followed by the treaty of Cateau-Cambresis (1559). Shortly afterwards Henry was accidentally wounded in a tournament by Montgomery, a Scottish nobleman and captain of his guard. He died from the wound on 10th July 1559. See works cited at FRANCE and CATHARINE DE' MEDICI.

Henry III., king of France, the third son of Henry II. and Catharine de' Medici, was born at Fontainebleau on 19th September 1551. On the death of Constable Montmorency he received the chief command of the army, and in 1569 gained two decisive victories over the Protestants at Jarnac and Moncontour. He showed his zeal for the Catholic cause by taking an active share in the massacre of St Bartholomew. In 1573 the intrigues of the queen-regent secured his election to the throne of Poland. But on receiving the tidings of the death of his brother, Charles IX., he fled by night from Cracow and came home to France to succeed Charles as king (1575). His reign was a period of almost incessant civil war between the Huguenots and the Catholics. The party of the latter, supported by the king's mother, and headed by Henry of Guise, formed the Holy League, the object of which was not merely to assert the undivided supremacy of Catholicism, but also to secure the reversion of the throne to the family of the Guises. Henry was quite unfitted to cope with the crisis. He showed both fickleness and want of courage in his public conduct; and in private life his days and nights were spent in an alternation of dissolute excesses and wild outbreaks of religious fanaticism. His favourite companions were a band of young men (the 'Mignons') as vicious as himself. At length in 1588 the assassination of the Duke of Guise in the king's antechamber, and of the Duke of Lorraine in prison, fairly roused the Catholic part of the nation to the utmost pitch of exasperation. The distracted king threw himself into the arms of Henry of Navarre, and the two sovereigns marched upon Paris at the head of a Huguenot army. But on 1st August 1589 Henry of France was stabbed by a fanatical Dominican named Jacques Clément; he died on the following day, nominating Henry of Navarre as his successor. With this king the male line of the house of Valois became extinct. See M. W. Freer, *Henry III., his Court and Times* (3 vols. 1858).

Henry IV., king of France and Navarre, surnamed 'the Great,' and 'the Good,' was born at Pau, 13th Dec. 1553. He was the third son of Antoine de Bourbon and Jeanne d'Albret, daughter and heiress of Henry, king of Navarre and Bearn. His father's death placed him under the sole control of his mother and grandfather, at whose court he was trained to the practice of knightly and athletic exercises, and inured to the active habits and rude fare common to the Bearnais mountaineers. His mother, who was a zealous Calvinist, was careful to select learned men holding her own tenets for his instructors; and having discovered that a plot was on foot to remove him to Spain by force, to train him in the Catholic faith, she conducted him, in 1569, to La Rochelle, and presented him to the assembled Huguenot army, at whose head he fought at the battle of Jarnac. Henry was now chosen chief of the Protestant party—although, on account of his youth, the principal command was vested in Coligny (q.v.)—and the third of the Huguenot wars began. Notwithstanding the defeats which the Huguenots had experienced in the next campaign, the peace of St Germain which concluded it was apparently most advantageous to their cause, and was speedily followed by a contract of marriage between Henry and Margaret of Valois, the sister of Charles IX. After much opposition on the part of both Catholics and Protestants, the marriage was celebrated with great pomp in 1572, two months after the sudden death of the Queen Jeanne, which was probably due to poison, and within less than a week of the massacre of St Bartholomew. It had been originally intended that Henry was to share the fate of his friends and co-religionists; but his life was spared on condition of his professing himself a Catholic. Three years he remained at the French court, virtually a prisoner; but at length, in 1576, he contrived to elude the vigilance of the queen-mother, and escaped to the camp of the Huguenots in Alençon. There, having revoked his compulsory conversion, he resumed the command of the army, and by his address gained several signal advantages, which constrained the king to consent to a peace highly favourable to the cause of the Reformers.

The death of the Duke of Anjou (late Alençon) gave Henry the rank, as first prince of the blood-

royal, of presumptive heir to the crown; while the murder of Henry III. in 1589 made him, in right of the Salic law, and as the nearest lineal male descendant of the royal house of France, rightful king of France. As a Protestant, lying under the ban of papal excommunication, he was obnoxious to the greater part of the nation; and finding that the Dukes of Lorraine and Savoy, and Philip II. of Spain, were prepared, each on his own account, to dispute his claims, he retired to the south until he could collect more troops and obtain reinforcements from England and Germany. His nearly hopeless cause, however, gradually gained strength through the weakness and internal dissensions of the Leaguers, who, in their anxiety to circumvent the ambitious designs which Philip II. cherished in favour of his daughter (niece of Henry III.), notwithstanding her exclusion by the Salic law, proclaimed the aged Cardinal Bourbon king, with the Duke of Mayenne lieutenant-general of the kingdom, and thus still further complicated the interests of their party. In 1590 Henry won a splendid victory over Mayenne at Ivry. In 1593 the assembly of the States-general, by rejecting the pretensions of Philip II., and insisting on the integrity of the Salic law, smoothed Henry's way to the succession, although it is probable that he would never have been generally acknowledged had he not, by the advice of his friend and minister, De Rosny, afterwards Duc de Sully (q.v.), formally professed himself a member of the Church of Rome. The ceremony of his recantation of Protestantism, which was celebrated with great pomp at St Denis in July 1593, filled the Catholics with joy, and was followed by the speedy surrender of the most important cities of the kingdom, including even Paris, which opened its gates to him in 1594. The civil war was not, however, wholly put down till four years later. In the same year, 1598, peace was concluded between Spain and France by the treaty of Vervins, which restored to the latter many important places in Picardy, and was otherwise favourable to the French king; but, important as was this event, it was preceded by a still more memorable act, for on the 15th April Henry had signed an edict at Nantes by which he secured to Protestants perfect liberty of conscience and the administration of impartial justice.

Henry was now left at liberty to direct his attention to the internal improvements of the kingdom, which had been thoroughly disorganised through the long continuance of civil war. The narrow-minded policy that had been followed during the preceding reigns had left the provinces remote from the capital very much at the mercy of the civic governors and large landed proprietors, who, in the absence of a general administrative vigilance, arrogated almost sovereign power to themselves, raising taxes and exacting compulsory services. These abuses Henry completely stopped, and by making canals and roads, and thus opening all parts of his kingdom to traffic and commerce, he established new sources of wealth and prosperity for all classes of his subjects. The mainspring of these improvements was, however, the reorganisation of the finances under Sully, who, in the course of ten years, reduced the national debt from 330 millions to 50 millions of livres, although arrears of taxes to the amount of 20 millions were remitted by the king during that period. On 14th May 1610, the day after the coronation of his second wife, Mary de' Medici, and when about to set out to commence war in Germany, Henry was assassinated by a fanatic named Ravaillac. Nineteen times before attempts had been made on his life, most of which had been traced to the agency of the papal and imperial courts, and hence the people, in their grief and consternation, laid Ravaillac's crime to the charge of the same influences. The grief of the Parisians was well-nigh delirious, and in their fury they wreaked the most horrible vengeance on the murderer, who, however, had been a mere tool in the hands of the Jesuits, Henry's implacable foes, notwithstanding the many concessions which he made to their order.

According to Henri Martin, Henry 'remains the greatest, but above all the most essentially French of all the kings of France.' His unbridled licentiousness was his worst fault, and the cause of much evil in his own and succeeding reigns; for his prodigality and weak indulgence to his favourite mistresses, Gabrielle d'Estrées and Henrietta d'Entragues, and his affection for the natural children which they bore him were a scandal to the nation, and a source of impoverishing embarrassment to the government.

As authorities in regard to Henry II., III., and IV., in addition to the general histories of France, the following works may be consulted: Anquetil, *Esprit de la Ligue*; Petitot's *Collection of Memoirs*; De la Saussaye, *Histoire de Blois*, *Documents de l'Hist. de France*; Matthieu, *Hist. de Henri IV.*; Memoirs and Letters of Sully, De Thou, D'Aubigné, Pasquier, Duplessis-Mornay; Capefigue, *Hist. de la Réforme et de la Ligue*; Perefixe, *Hist. de Henri IV.*; M. W. Freer, *History of the Reign of Henry IV.* (6 vols. 1860–63); H. de la Ferrière's *Henri IV.* (1890); Bingham's *Marriages of the Bourbons* (1889); and monographs by P. F. Willert (1893) and E. T. Blair (Phila. 1894).

Henry V. OF FRANCE. See CHAMBORD.

Henry, surnamed THE NAVIGATOR (Dom Henrique el Navegador), a famous Portuguese prince, the fourth son of João I., king of Portugal, was born at Oporto in 1394, and first distinguished himself at the conquest of Ceuta in 1415. After the death of his father he took up his residence at the town of Sagres, in Algarve, near Cape St Vincent; and while prosecuting the war against the Moors of Africa, his sailors reached parts of the ocean heretofore unvisited and unknown. The grand ambition of Henry was the discovery of unknown regions of the world. At Sagres he erected an observatory, to which he attached a school for the instruction of youthful scions of the nobility in the sciences necessary to navigation. Subsequently he despatched some of his pupils on voyages of discovery, which resulted at last in the discovery of the Madeira Islands in 1418. Henry's thoughts were now directed towards the auriferous coasts of Guinea, of which he had heard from the Moors; and in 1433 one of his mariners sailed round Cape Nun, until then regarded as the farthest point of the earth, and took possession of the coasts as far south as Cape Bojador. Next year Henry sent out a larger ship, which reached a point 120 miles beyond Cape Bojador; and at last, in 1440, Cape Blanco was reached. Up to this period the prince had borne all the expense of these voyages himself; henceforth, self-supporting societies were formed under his patronage and guidance, and what had formerly been the affair of a single individual now became the passion of a whole nation. But Henry did not slack personally in his efforts. In 1446 his captain, Nuno Tristam, doubled Cape Verd in Senegambia, and in 1448 Gonzalez Vallo discovered three of the Azores. Henry died in 1460. A great national celebration of his memory took place in Portugal in 1894. Henry's mother was the English Philippa, daughter of John of Gaunt.

See works by Wappaus (Gott. 1842) and De Veer (Koningsb. 1864); the *Life* and the *Discoveries* of Henry, both by Major (1868 and 1877); and a short work by Raymond Beazley (1895).

Henry of Huntingdon, English chronicler, was brought up in the household of the Bishop of Lincoln, and about 1120 became Archdeacon of Huntingdon. His *chef d'œuvre* is the *Historia*

Anglorum, coming down to 1154. Besides this he wrote several epistles on historical matters and some poems. His *History* was published for the Rolls series by T. Arnold in 1880; an English translation by T. Forrester appeared in 1853. See Gairdner's *Early Chroniclers of Europe* (1879).

Henry the Minstrel. See HARRY (BLIND).

Henry, JOSEPH, physicist, was born either in 1797 or 1799, in Albany, New York. There, while apprenticed to a watchmaker, he took up the study of science, and earned means to carry him through the course at the academy, in which institution he became instructor in Mathematics in 1826. In 1832 he was called to the chair of Natural Philosophy at Princeton; in 1846 he was elected the first secretary of the Smithsonian Institution, and removed to Washington, where he died, 13th May 1878. Apart from his great services to the Smithsonian Institution, with Henry's name are associated the discovery of a relation between the number of coils of wire round the electro-magnet and the construction of the battery to work it, which prepared the way for Morse's invention, in which his principles were applied to make the instrument effective at a distance; the discovery of a singular form of electrical induction; researches in meteorology and acoustics; and the establishment of the national lighthouse board, of which he was chairman from 1871 until his death. He was LL.D. of Union (1829) and Harvard (1851), and a member of many scientific societies in America and Europe. Of his numerous papers 2 vols. were published in 1886; and a *Memorial* was published by order of congress in 1880.

Henry, MATTHEW, Nonconformist divine, the son of Philip Henry, one of the 2000 ministers who left the Church of England on the passing of the 'Act of Uniformity,' was born at Broad Oak farmhouse, in Flintshire, October 18, 1662. In 1687 he became pastor of a congregation of dissenters at Chester, where he remained until May 1712, when he removed to a charge at Hackney, near London. He died of apoplexy, June 22, 1714, at Nantwich, while on his return from a visit to his old friends at Chester. His principal work is an *Exposition of the Old and New Testament*, in 5 vols. folio (1710 and repeatedly since), which was carried down only to the Acts of the Apostles. The remainder was completed after Henry's death by various ministers, whose names are given in some of the editions. This commentary is not a critical work, but rather practical and devotional in its aim, and as such occupies a high place amongst works of its class. Henry wrote several other books, which were published at London in 1830. There are biographies of him by Tong (1716), J. B. Williams (1865), Davies (1844), Hamilton (1853), and Chapman (1859); and see the *Diaries and Letters of Philip Henry*, edited by Matthew Henry Lee (1883).

Henry, PATRICK, a great American orator and patriot, was born in Hanover county, Virginia, 29th May 1736. His father was a native of Scotland, his grandmother a cousin of Robertson the historian. Henry received a share of classical education, but at an early age entered business, and married at eighteen. Having failed successively in 'store-keeping' and in farming, he became a lawyer in 1760, and three years later found his opportunity, when, having been employed to plead the cause of the people against an unpopular tax, his great eloquence seemed suddenly to develop itself. This defence placed him at once in the front rank of American orators, and his later speeches advanced him to their head. From amid the sullen murmurs and remonstrances that the passage of the stamp-act evoked, his voice it was that first rose in a clear, bold call to resistance. Throughout the war of independence he was a zealous patriot. He was a delegate to the first Continental congress, which met at Philadelphia in 1774, and delivered the first speech in that assembly —a speech that for fiery eloquence and lofty tone was worthy of so momentous a meeting. In 1776 he carried the vote of the Virginia convention for independence; and in the same year he became governor of the new state. He was afterwards four times re-elected. In 1791 he retired from public life, and returned to his practice; in 1795 he declined the secretaryship of state offered him by Washington. He died 6th June 1799. Henry was an able administrator, a wise and far-seeing legislator; but it is as their greatest orator that his memory lives in the minds of most Americans. No one who has come after has approached him in ability to stir and sway the passions of an audience. The classical Life is that by William Wirt; others are Everett's, in Sparks's *American Biography*, Tyler's (1887), and W. W. Henry's (3 vols. 1891).

Henry, ROBERT, a Scottish historian and divine, was born at St Ninians, in Stirlingshire, February 18, 1718. He studied at the university of Edinburgh, and from 1768 till his death in 1790 was one of the ministers of that city. In his *History of Great Britain on a New Plan* (6 vols. 1771–93) he adopted the 'new plan' of devoting chapters to the social aspects of successive periods, and thus tracing the progress of civilisation in Great Britain; but the work has no pretensions to critical acumen or even strict accuracy, and consequently is now of little value.

Henry, WILLIAM, a chemist, was born at Manchester, 12th December 1774, and died on 2d September 1836 at Pendlebury near that city. In 1795 he began to study medicine at Edinburgh, but at the end of his first session he returned home to superintend a chemical business which had been established by his father, and it was not until 1805 that he was able to resume his studies at Edinburgh. He only practised for a short time in Manchester, preferring to devote himself to original investigation in chemistry. He was the author of some very valuable papers in the *Philosophical Transactions* (chiefly on the chemistry of the gases); and his *Elements of Experimental Chemistry*, in two volumes, which was published in 1799, reached an eleventh edition in 1829. Henry was awarded by the Royal Society the Copley gold medal in 1809. The Memoirs of the Manchester Society are chiefly indebted to him and to Dalton for their high scientific character.

Henryson, ROBERT, Scottish poet, was born about 1425, and was most likely educated abroad. He is usually designated schoolmaster of Dunfermline, and he seems besides to have practised there the profession of a notary. His death may safely be put about the end of the 15th century. Of his poems the most important is his *Testament of Cresseid*, in the form of a kind of supplement to Chaucer's poem on the same subject. Another, *Robene and Makyne*, is especially interesting as the earliest extant specimen in the Scottish dialect of pastoral poetry. Other works are a metrical version of thirteen of the *Fables of Æsop*, with morals suited to the questions of the time, and the somewhat feeble *Orpheus and Eurydice*. All previous editions of Henryson's poems were superseded by that of Dr David Laing (Edinburgh, 1865).

Henslowe, PHILIP, a stage-manager in Shakespeare's time, was originally a dyer and starch-maker, but became in 1584 lessee of the Rose theatre on the Bankside. From 1591 till his death in 1616 he was in partnership with Edward Alleyn, (q.v.), who married his step-daughter in 1592. Henslowe's business diary from the year 1593

to 1609 has fortunately been preserved at Dulwich College, and contains invaluable information about new plays and all the stage business of Shakespeare's day. It was edited by J. Payne Collier for the Shakespeare Society in 1841, but his reprint is unreliable, marred by many ugly interpolations and worse.

Hepar (Gr. *hepar*, 'the liver') is the name given by the older chemists to various compounds of sulphur, from their brown, liver-like colour. *Hepatic* means belonging to the liver; as, *hepatic* artery, vein, duct, &c. *Hepatica* is a term for medicines which affect the liver and its appendages.

Hepatica, a genus of hardy perennial plants belonging to the natural order Ranunculaceæ, closely related to Anemone, and formerly included in that genus under the name *A. Hepatica*. *H. triloba* is the best known species, and has long been extremely popular in the flower-garden on account of its flowering in early spring in great profusion; the flowers of the several varieties being also very brilliantly coloured. The normal colour of the species appears to be purple, but there are varieties with red, deep blue—of these there are single and double-flowered forms—and pure white flowers. It is a native of many hilly parts of Europe. Its roots are powerfully astringent, but have not the acrid qualities possessed by many of the Ranunculaceæ. *H. angulosa* is the only other species known to cultivation; it is larger in all its parts; the flowers are pale blue. It is a native of Transylvania, and both species delight in partial shade rather than full exposure to the sun. For another kind of Hepatica, see LIVERWORTS.

Hepatitis (Gr. *hēpar*, 'the liver'), inflammation of the Liver (q.v.).

Hephæstus, the god of fire and of smithying among the Greeks, is represented by Homer as lame, walking with the aid of a stick, and panting as he goes. His character is good-tempered, affectionate, and compassionate (cf. Æsch. *Prometheus Bound*). There is also an element of the comic connected with him; his gait and ungainly figure provoke the laughter of the gods. On the other hand, he is himself given to practical jokes; he constructs a seat on which his mother sits down, but from which she is unable to rise. His mother was Hera, who (according to Homer) liked her lame child so little that she cast him far out from heaven. Another account of his fall from heaven is also given by Homer—that Zeus threw him out for siding with Hera against him. The story of the seat just mentioned is brought into connection with the former version of his fall; none but he could release Hera, nor would he help her until restored to his place in heaven. Mythologists interpret the fall of Hephæstus as the fall of lightning from the sky (= Hera, but see HERA). Amongst the myths in which Hephæstus is concerned we must mention that of the manufacture of the first woman, Pandora (by whom all evil came into the world); the birth of Athene from the head of Zeus, when Hephæstus with an axe acted as midwife; and the birth of Erichthonios, who claimed Hephæstus for father, and from whom the Athenians counted themselves as descended.

In discussing the origin and antiquity of Hephæstus it is necessary to bear in mind that this deity appears under two aspects, which would naturally come to be combined though they were not necessarily united from the first. Hephæstus is the god of smithying and also the god of fire. To begin with the latter aspect of the deity, there are so many points of resemblance between the divine smith of the Greeks and the Wayland Smith (q.v.) or Wieland or Volundr of the northern members of the Indo-European family of peoples that some comparative mythologists have felt justified in inferring that the divine smith was a conception known to the Indo-Europeans before their dispersion. On the other hand, it is maintained that the resemblances are due, not to the joint inheritance by different peoples of the same original myth, but to borrowing at a late period. The stories of Wieland were a conscious loan on the part of the Teutons, in the 6th century A.D., of various classic tales about Dædalus and Vulcan (W. Golther, *Germania*, *xd.* xxiii. 449). This latter view has in its favour the fact that the undivided Indo-Europeans were unacquainted with the metals, except copper, and totally ignorant of the art of smithying. The divine smith, therefore, is a mythological conception which must be posterior to the dispersion of the Indo-Europeans. Remains the question then whether the other aspect under which Hephæstus appears, that of the god of fire, goes back to primeval times. On the one hand, other Indo-European peoples have fire-gods of their own; the Hindus Agni, and the Norsemen Loki. But, unfortunately, there is no phonetic identity between the names of the various deities. We have therefore nothing beyond general considerations to guide us. The want of philological equivalence in the names of various fire-gods makes rather against the supposition that the primitive Indo Europeans recognised a god of fire. On the other hand, there is no improbability inherent in the assumption that they were at least as far advanced as the Australian aborigines who worship fire. The fact that several members of the Indo European family agree in the worship of a fire-god does not, of course, demonstrate that the worship was a joint inheritance, for the worshipper's idea of worshipping so useful an element occurs independently to peoples who cannot be supposed on any theory to be connected. Finally, the lameness of Hephæstus may be an expression of the unsteady, flickering motion of flame; but it is well to remember that amongst savages the people to whose lot it particularly falls to tend the fire are the lame.

Hephæstus was by the Romans identified with their own fire-god Vulcan (q.v.).

Heptam'eron. See MARGARET OF NAVARRE.

Heptarchy, the name sometimes applied to the seven kingdoms supposed to have been established by the Saxons in England. The term is completely misleading if it be taken to mean that there were neither more nor less than seven distinct kingdoms in the country down to the time of Egbert; but is permissible enough if taken to mean only that the chief kingdoms at various periods from the 5th to the 9th century were Wessex, Sussex, Kent, Essex, East Anglia, Mercia, and Northumbria (see ENGLAND). The shadowy sovereignty of the Bretwalda is discussed under that head.

Heptateuch, a word sometimes used for the first seven books (Gr. *hepta*, 'seven;' *teuchos*, 'instrument,' 'volume') of the Old Testament—formed on the analogy of Pentateuch and Hexateuch. See BIBLE, Vol. II. p. 119.

Hera, the daughter of Kronos, the sister and at the same time the wife of Zeus, was the Greek goddess of marriage, child-birth, and menstruation. In the *Iliad* she takes the part of the Greeks, and hates the Trojans, because Paris awarded the fatal apple of discord to Aphrodite. She is the mother of Hephæstus, the god of fire, of Ares, the god of war, of Eileithyia, of Hecate, and of Hebe. Three towns, according to Homer, are especially dear to her—Argos, Sparta, and Mycenæ. She is represented by the poet as jealous and ill-tempered. As the goddess of lawful marriage she persecutes the illegitimate offspring of her consort Zeus, such as Heracles and Dionysus. She conspires against

Zeus, who makes reprisals by hanging her up from heaven with golden fetters on her hands and a couple of anvils on her feet. In consequence she subsequently preferred to thwart him secretly rather than defy him openly.

Many interpretations of this figure in mythology have been given in ancient and in modern times: Empedocles and Euripides regarded her as the goddess of the earth; Plato, and after him the Stoics, as the goddess of the clouds. In modern times she has been regarded as the goddess of the lower air, which is, like Juno in Virgil, *varium et mutabile semper*, in contrast to Zeus, who is the god of the serene and upper ether. Roscher (*Stud. z. Vergl. Myth. d. Griechen u. Römer*) interprets her as a moon-goddess of Græco-Italian times. He bases this view on the fact that she resembles all other moon-goddesses in being the goddess of women, and in presiding over menstruation and child-birth; in possessing as her attributes the torch, the bow, and the crown of stars; in the fact that the new moon was the time for her festivals, and finally, on the resemblance between Hera and Juno. As regards the resemblance between these two goddesses, they are each the spouse of the supreme god of the sky, they have the same functions relatively to women, their cult and attributes are similar; and finally, the ancient Epirotic name for Hera was Dione, which corresponds phonetically to Juno.

The ancient identification of Hera with the earth may at once be dismissed. There is no resemblance between Hera and Gaia, or any other chthonian (earth) deity. Nor can she be regarded as a goddess of the lower air: goddesses of the air are unknown to any related people, and no primitive tribe (or any other tribe than that of mythologists) would distinguish between the lower air and the serene ether. If it is an unalterable canon of mythology that all deities must be nature-myths of some kind, then Roscher's interpretation of Hera as a moon-goddess is the most probable. Otherwise we may be content to seek the origin of Hera simply in the necessity under which the worshippers of Zeus lay of providing him with a spouse. And here it becomes a point of some importance to determine at what period Hera was created—whether before the dispersion of the Indo-Europeans, or after their dispersion, and while the joint-ancestors of the Greeks and Italians yet lived together in a Græco-Italian period, or in purely Greek times. Now, no one claims that Hera dates from before the dispersion of the Indo-Europeans—i.e. from the time when Zeus, though the supreme god, was still to the average Indo-European mind also and always the sky. Nor can Roscher be said to have made out his case for the Græco-Italian origin of the goddess: the fact that Dione in one part of Greece was once the supreme goddess, and was dethroned by Hera, is not enough to prove that Hera was generally, or indeed ever, known as Dione; and, further (to say nothing of the fact that Diana rather than Juno is the phonetic equivalent of Dione), there is no identity between the mythological functions of Dione and Juno on the one hand, or of Dione and Hera on the other. As for the resemblances of Hera and Juno, they are not greater than might reasonably be expected: Greeks and Italians, alike inheriting the sky-god (not from a Græco-Italian period, the very existence of which is doubtful, but from primitive times), would alike feel the necessity of providing him with a wife; and if in both cases the wife of the supreme god came to be regarded as the goddess of marriage, and of all appertaining to it, the coincidence is not astonishing when we reflect on the considerable similarity between the two peoples. If then Hera does not date from before purely Greek times, the necessity for interpreting her as a nature-myth is considerably weakened, for as long as Zeus was but the sky we should expect that he could only be married to some nature-power; but when the personality of the god had come to be usually conceived apart from the element from which he originated, we should expect that his consort would be in mythology what she undoubtedly was in art—merely the feminine counterpart of the supreme deity. And, finally, on this view Hera's resemblance to moon-goddesses would be the result of her position as the goddess of marriage, instead of her position as the goddess of marriage being the result of a lunar origin.

Heracleia, an ancient city of Magna Græcia, situated near the river Aciris, about 3 miles from the Gulf of Tarentum. It was founded about 432 B.C., and under the Romans became a prosperous and refined city, though it never acquired any historical prominence. Near it, however, Pyrrhus defeated the Romans in 280 B.C. In the neighbourhood, besides a large number of coins, ranking among the very finest relics of antiquity, there have been discovered (1753) two bronze tablets (*Tabulæ Heracleenses*), containing a copy of the *Lex Julia Municipalis* (45 B.C.), and forming one of the principal authorities for a knowledge of the municipal law of ancient Italy. This inscription has been published by Muratori, Savigny, and others. Two other cities of this name deserve mention: (1) HERACLEIA MINOA, between Agrigentum and Selinus, on the south coast of Sicily, originally a Phœnician town; and (2) HERACLEIA PONTICA, on the coast of the Black Sea in Bithynia, destroyed by Cotta in the Mithridatic war.

Herac'lian, an officer of the Emperor Honorius (q.v.), who as governor of the province of Africa rendered good service during the invasion of Alaric. He became consul, but, revolting against Honorius, was defeated on invading Italy (413 A.D.), and slain soon after in Africa.

Heracli'dæ means, in its widest sense, all 'the descendants of Heracles' (Hercules), but is specially applied to those adventurers who, founding their claims on their supposed descent from the great hero (to whom Zeus had promised a portion of the land), were said to have joined the Dorians in the conquest of the Peloponnesus. Several expeditions were undertaken for this purpose, the last and greatest occurring eighty years after the Trojan war. The chiefs of the invaders defeated Tisamenus, son of Orestes, and grandson of Agamemnon, and took possession of the Peloponnesus. See GREECE.

Heracli'tus (Gr. *Hērakleitos*), a Greek philosopher, was born at Ephesus, in Asia Minor, and flourished about 500 B.C. He is said to have resigned the hereditary office of 'king' of his native city in favour of his younger brother, and to have given himself up to a life of solitary contemplation. In the old traditions he was called, from his gloomy way of looking at things, 'the weeping philosopher,' in contrast to Democritus, 'the laughing philosopher.' He died at the age of sixty. The result of Heraclitus' meditations was a work *On Nature*, of which only a few obscure fragments remain. The fundamental tenets in his philosophy are that all things are in a constant flux of becoming and perishing, that fire is the primordial principle of all existence, and that the supreme law of existence is the harmony that results necessarily from the operations of universal reason. His enigmatical fragments were published by Bywater in 1877. See *Die Philosophie des Herakleitos des Dunklen* (1858) by the famous Socialist Lassalle.

Herac'lius, a Byzantine emperor (610–41), of splendid but fitful genius, was born in Cappa-

docia about 575 A.D. In 610 he headed a revolt against the tyrant Phocas, slew him, and ascended his throne. At this time the empire was in great straits: the Avars threatened it on the north west, and the Persians invaded its frontiers from the Euxine to Egypt. The armies of Khosrau Chosroes II. captured Damascus in 613, and in the following year Jerusalem, from which they carried off the sacred cross; then Syria and Egypt were conquered, and the whole of Asia Minor to the gates of Chalcedon, over against Constantinople. At length Heraclius bestirred himself, and, having in 620 concluded a treaty with the Avars, set about disciplining an army. Two years later he took the field against his eastern enemy, and in a series of most brilliant campaigns utterly routed the generals of Persia several times in battle, won back his lost provinces, shut up Khosrau II. within the walls of his strong capital of Ctesiphon (628), and compelled him to restore the true cross, which Heraclius solemnly carried back to Jerusalem in 629. Two years later a new and more formidable enemy appeared in the south-east—viz. the followers of Mohammed, who speedily won from the Christian emperor nearly all that he had gained from the Persians, the people of Asia Minor alone opposing any resistance to their impetuous enthusiasm of conquest. Meanwhile Heraclius, strange to say, wasted his time within his palace at Constantinople in inexplicable inactivity, partly in reprehensible self-indulgence, partly in theological disputes. He died in 641, leaving the throne to his son, Constantine III. See Drapeyron, *L'Empereur Heraclius* (1869).

Herald (Old High Ger. *hariold*—i.e. *hari-wald*, 'army strength'), an officer who was in early times the messenger of war and peace between sovereigns, and of defiance and courtesy between knights, his office also including the superintendence of jousts and tournaments, and the regulation of public ceremonials. When the bearing of coat-armour came to be reduced to a system its supervision became in France, England, Scotland, and some other countries one of the functions of the herald. A herald was generally attached to every order of knighthood. Heralds had their attendants, called *pursuivants*, who were presumed to be learning the duties of a herald. Both had official titles; and often not only sovereigns, but the greater nobles, had their heralds and pursuivants. English records and chronicles of the 14th and 15th centuries contain allusions to York, Windsor, Chester, Lancaster, Arundel, Clarencieux, Leopard, and other heralds, and to Falcon, Portcullis, Antelope, and other pursuivants; and in Scottish records of the same date the heralds mentioned include Lyon, Rothesay, Marchmont, Snowdoun, Ilay, and Albany, and the pursuivants Carrick, Diligence, Unicorn. In France, England, Scotland, Burgundy, and some other countries the chief of the heralds acquired the title of *King-of-arms*, and had more or less a judicial power of regulating the bearing of coat-armour. The office of *Montjoie roi d'armes* in France is as old as the 13th century. In England in the reign of Edward III. there were two kings-of-arms—Norroy and Surroy—the jurisdiction of the one being to the north, the other to the south of the Trent. The designation Surroy was changed by Henry V. to Clarencieux. And the same king instituted a new king-of-arms called Garter, who was to be connected with the order so called, and to be principal king-of-arms of England. In Scottish records mention first occurs of Lyon King-of-arms (who took his title from the lion in the royal shield) in the beginning of the 15th century. The title of Ulster King-of-arms was created in the reign of Edward VI.; but there existed an Ireland King-of-arms at an earlier date. Certain fees were secured to the English kings-of-arms and heralds in connection with public ceremonials and creations of peers in 1408; and in 1483 Richard III. incorporated them into a collegiate body, known as the Heralds' College, or College of Arms, presided over by the Earl Marshal (whose office is hereditary in the family of the Duke of Norfolk), the other officers including Garter, principal king-of-arms, with Clarencieux and Norroy under him, besides six heralds, named Chester, Windsor, Lancaster, Richmond, York, and Somerset, and four pursuivants, Bluemantle, Portcullis, Rouge Dragon, and Rouge Croix. A residence was at first granted to the heralds, called Cold-harbour or Pulteney's Inn, in the parish of All Saints; and in 1554 Queen Mary gave them a building opposite St Bennets, which was rebuilt after the great fire of 1666, and is still the official residence of the officers of arms and depository of their archives. Heralds extraordinary are sometimes appointed by the crown, who are not members of the Heralds' College.

The College of Arms has no jurisdiction out of England. Functions similar to those which the English kings-of-arms exercise under the Earl Marshal are discharged by Lyon King-of-arms in Scotland, and Ulster King-of-arms in Ireland, directly under the crown. There are under Lyon three heralds, Rothesay, Marchmont, and Albany, and three pursuivants, Unicorn, Bute, and Albany; their duties are chiefly connected with public ceremonials and royal proclamations. Lyon's armorial functions are exercised alone, as judge in the Lyon Court, where, however, the clerk of court or his deputy is sometimes a herald.

A tabard with the royal arms embroidered on both sides of it has long been the official dress of heralds and pursuivants. The tabards of the kings-of-arms are richer in material. The insignia of the latter also include a crown, a baton or sceptre, and a chain with a medal or badge attached to it.

Heraldry is in its original and more comprehensive sense the knowledge of the whole multifarious duties of a Herald (q.v.); in the more restricted signification in which the term is used by most modern writers, and that assigned to it in the present article, it is a knowledge of the laws that regulate armorial insignia—i.e. the devices that appear on shields, with their attendant crests, supporters, and badges. After occupying for ages the attention of the learned, and forming an important branch of a princely education, this study fell for a time into neglect and disrepute, and was abandoned to coach-painters and undertakers, a degradation owing in part to the endless tissue of follies and mystifications with which it had been interwoven. Modern criticism has rescued heraldry from these pedantries and absurdities, and imparted to it a new interest as a valuable aid to historical investigations.

Instances occur in remote times of nations, tribes, and individuals distinguishing themselves by particular emblems or ensigns—e.g. the standards of the twelve tribes of Israel, of the Egyptians and Assyrians, and the Roman eagle and cohort ensigns. Figures, symbolical and ornamental, singularly like some of those of heraldry, are found mixed with other emblems in Egypt, China, India, Japan, on Etruscan vases, and on Greek coins; and shields decorated with devices are described by both Homer and Æschylus. Yet there is exhaustive negative evidence that nothing that can be properly called armorial devices were used either on shields or banners before the middle of the 12th century. The shields of the French knights in the first crusade presented a plain face of solid metal, nor is there any certain evidence of armorial bearings having been in use in the second crusade, 1147 A.D. The representation of the Norman invasion and conquest

of England on the Bayeux Tapestry (q.v.) contains on the shields of both Saxons and Normans figures of a semi-armorial character, including dragons, crosses, roundles, irregularly arranged, also striped banners; but there is no attempt to individualise the arms of the different heroes of the fight. Yet the rude devices on these shields seem to have been the precursors of systematic armory; and in the later half of the 12th century similar figures began to assume the permanent or hereditary character which is essential to the idea of armorial ensigns. Their use began with the French and Germans, and soon spread from France to England. The other nations of Europe followed; and their nearly simultaneous adoption seems to have been in part the result of the intimate intercourse which the crusades brought about between the chief sovereigns and warriors of Europe. Tournaments helped to bring arms into fashion, and before long the bearing of hereditary arms on shields and banners became one of the most prominent features of medieval life. Some sort of armorial insignia were certainly depicted on the shields borne in the third crusade, which took place in 1189; and in the same century originated the fleurs-de-lis of France, and the lions or leopards of England. In the 13th century the practice was introduced of embroidering the family insignia on the surcoat worn over the hauberk or coat of mail, whence originated the expression *coat-of-arms*. Arms were similarly embroidered on the jupon, cyclas, and tabard, which succeeded the surcoat, and also enamelled or otherwise represented on furniture, personal ornaments, and weapons. Sealing had, before the introduction of heraldry, become a legal formality necessary to the authentication of a deed, and from the 13th century onwards the seals of all persons of noble or gentle birth represented their armorial ensigns (see SEAL). Those seals, appended to charters, are among the most valuable materials for tracing the history of heraldry, though they labour under the disadvantage of not indicating colours, as the arms on painted windows do.

Among important adminicles for the study of English heraldry are certain extant rolls or records of arms of the times of Henry III., Edward I., Edward II., Edward III., and also of later reigns, in the British Museum, Heralds' College, and elsewhere—a good many of which have been published or privately printed. The earliest of these, of date 1240 to 1245, show that heraldry had at that date been reduced to a systematic shape. In most cases the arms on these rolls are verbally described; in a few instances they are drawn. Along with the rolls of arms may be classed a heraldic poem known as the *Roll of Caerlaverock*, in which are recited in Norman-French the names and arms of the knights-banneret who were present at the siege of that fortress in 1300. It was edited by Sir Harris Nicolas (1828), and by Thomas Wright (1861). Only a little later in date is a manuscript armorial of all Christendom, the work of a Flemish herald of the middle of the 14th century, preserved in the Royal Library at Brussels, in which the shields are beautifully illumined in colours, with, in many cases, the addition of helmets and crests; it has been reproduced in fac-simile by M. Bouton. A valuable Swiss roll of the same century has been fac-similed in the same way by the Antiquarische Gesellschaft of Zurich. Authentic materials of this kind enable us to trace the steps by which the usage of arms reached the still more systematised form which it assumes in the works of the established writers on heraldry. In the hands of these authors, the earliest of whom wrote at the end of the 14th century, the historical part of the subject had been obscured by a tissue of fictions, which had a very misleading effect down to a quite recent time. The arms assigned to our forefathers Adam and Noah, to the old Jewish and pagan worthies, and to the Apostles, have long ceased to be believed in; but till a very recent date the coats of Edward the Confessor and of William the Conqueror were regarded as thoroughly historical. No less spurious than the arms of Edward the Confessor are those given by George Rüxner, herald to the Emperor Maximilian I., in his *Thurnierbuch* to knights of Germany of the 10th century, and his *Leges hastiludiales* of Henry the Fowler, who flourished two hundred years before the earliest germs of heraldry, one of which laws made it imperative for the combatants in tournaments to have borne 'insignia gentilitia' for four generations. These laws of Henry the Fowler have imposed not only on the German armorialists of last century, but on Mr Ellis, who in his ingenious plea for the antiquity of heraldry, appeals to them with full faith in their genuineness. Modern German critics, however, reject them as a palpable forgery.

In the infancy of heraldry every knight seems to have assumed what arms he pleased. Animals, plants, imaginary monsters, things artificial, and objects familiar to pilgrims and Crusaders, were all fixed on; and whenever it was possible, the object chosen was one whose name bore sufficient resemblance in sound to suggest the name or title of the bearer of it. The charge fixed on was used with great latitude, singly or repeated, in any way which the bearer of the shield chose, or which the form of his shield suggested. But as coats-of-arms multiplied, different knights occasionally fixed on the same symbol, and the confusion which arose from the similarity of coats-of-arms could only be obviated by a restraint being placed on the bearer's fancy, and regulations being introduced regarding the number, position, and colour of the charges, and the attitudes of the animals represented. As heraldry became more and more consolidated into a system, the true origin was lost sight of, and the fertile imagination of the early armorialists led them to invest the most common charges with mystical meanings, and to trace their original adoption to the desire of commemorating the adventures or achievements of the founders of families. The legends ascribing an origin of this kind to early armorial bearings have, wherever it has been possible to investigate them, proved fabrications. For the first few centuries of the existence of heraldry a very large number of the insignia, both of families and of kingdoms, were, as already remarked, *armes parlantes*, though the allusion can now in many cases be traced with difficulty. The lion of Leon and Louvain, the castle of Castile, the bear of Berne, the column of the Colonna family, are well-known continental examples; and in England we have three fountains for Wells, a whirlpool (gurges) for Gorges, a calf for Vele. At the same time commemorative heraldry, which became common in later times, was not absolutely unknown in the 14th century, one of the earliest instances being the heart introduced into the Douglas coat, in memory of the pilgrimage of the good Sir James with the heart of his royal master, found on the seals of the Douglas family as early as 1356.

As no two families in the same kingdom were allowed to bear the same arms, the right to bear a particular coat sometimes became a matter of fierce dispute. It lay in England with the constable and marshal, as judges in the Court of Chivalry, to decide questions of this kind, with a right of appeal to the king; and one of the most famous contests before them was that between the families of Scrope and Grosvenor, in 1385, for the right to bear the coat azure, a bend or; when John of Gaunt was one of the witnesses examined, and the undifferenced coat was adjudged to Scrope.

In course of time the right to use a coat-of-arms became, like the *jus imaginum*, the distinctive privilege of the noble, the word being used here in the continental sense, analogous to the English Gentleman (q.v.); and the privilege transmitted to all his descendants in the male line. When a prince made a plebeian noble, as it was competent for him to do, the patent of nobility defined what arms he was to bear.

In England a proclamation of Henry V. restrained the private assumption of armorial insignia, by prohibiting all who had not borne arms at Agincourt to assume them, except in virtue of inheritance or a grant from the crown. On the establishment of the Heralds' College (see HERALD) in 1483, the regulation of matters armorial was to a large extent delegated to the kings-of-arms and heralds acting under the Earl Marshal. Periodical visitations of the different counties were directed to be made to take cognisance of the arms, pedigrees, and marriages of the nobility and gentry of England. These visitations went on at varying periods from 1528 down to 1704, and are the principal source of evidence as to the hereditary right to bear arms in England. Among the functions exercised by the English kings-of-arms (the chief of whom is Garter King-of-arms) are the assigning of appropriate insignia to persons who have acquired a social importance that entitles them to take their place among the gentlemen of coat-armour of the country. Lyon King-of-arms, besides being a judicial officer having cognisance of all questions regarding the right to arms, exercises by direct delegation from the crown similar functions in the case of Scotsmen in the way of granting arms to *novi homines*; as does Ulster King of arms in the case of Irishmen. The wrongful assumption of arms is still in Scotland, if not in England, an act for which statutory penalties can be enforced against the assumer.

While there is nowhere on the Continent an institution similar to the English Heralds' College, there still exists in Prussia, Austria, Bavaria, Russia, Holland, and Belgium, and some other continental countries, a direct supervision of armorial insignia, which takes place through the chancery of the orders of the kingdom. In Sweden and Norway the abolition of titles of nobility has made the administration of armorial matters more lax, though the preservation of the orders of knighthood implies a chancery or office of regulation so far as they are concerned. In France there is now no *juge d'armes*; and spurious heraldry figures largely on carriages and elsewhere in Paris. In the United States the stars and stripes are said (erroneously, it would appear; see FLAG, Vol. IV. p. 665) to be derived from the arms of Washington; and it is not unusual for individuals and families to trace their descent from old-world houses, and to assume the arms proper to their name. So in the British colonies.

Not only families, but kingdoms, feudal lordships, towns, episcopal sees, abbeys, kings-of-arms in their official capacity, and corporations may by heraldic usage bear arms. The arms of two or more states ruled by one sovereign prince are marshalled together quarterly or otherwise in one escutcheon; and it has been the practice of many sovereigns to marshal along with their own arms of dominion, arms of territories of which they are not in possession, but to which they claim a right. Thus, England bore the arms of France from the time of Edward III. till 1801; and the kings of Naples and of Sardinia were in use to bear the arms of Cyprus and of Jerusalem. Similarly it has been the practice of the Dukes of Athole and Earls of Derby, as having been lords of Man, to quarter the arms of that island; and feudal coats are borne quarterly and *en surtout* by various peers of Scotland. As to honourable additions to arms granted by sovereigns, see AUGMENTATION.

While family arms transmit in the male line to the descendants of the bearer of them, to be borne by cadets with recognised differences, an heiress in the heraldic sense—i.e. a daughter who represents her father, conveys her arms to her husband (provided he be himself a gentleman of coat-armour) to be marshalled in accordance with certain rules with his own. Occasionally the arms of a great heiress are allowed altogether to supersede the paternal coat; and sometimes a successor who is a stranger in blood has been empowered to assume adoptive arms to fulfil the wish of a testator.

Heraldry is thus, in one of its aspects, a faithful chronicler of the history both of royal dynasties and of private families. Every change in the hereditary succession of a kingdom, every union of two houses by marriage, occasions a corresponding change in the coat-of-arms; the position which the members of a house occupy in the family tree is duly indicated, and an armorial shield is thus a record whose nice distinctions indicate to all who understand its language, a number of material facts regarding the owner of it. Heraldry is in this way an aid to the study of history, general and local. It has often afforded the key to questions of disputed succession; and seals, baronial and monumental carvings, and shields in church windows, have all been recorded in courts of law as evidence in obscure questions of marriage and descent.

The Shield.—A coat-of-arms is composed of charges depicted on an escutcheon representing the old knightly shield. The word 'escutcheon' is derived from the French *écusson*, which signified a shield with arms on it, in contradistinction from a shield generally. The forms of the shield represented in heraldry, as in war, differed at different times. The actual shields of the 11th and 12th centuries were in shape not unlike a boy's kite.

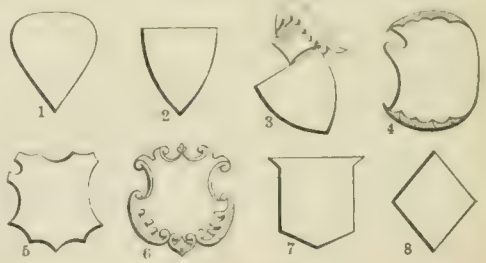


Fig. I.—Shields.

They were curved to encircle the body, and in some early seals are so represented; but, after heraldry began to be systematised, we generally find them engraved on seals and monuments as if flattened, to let the armorial design be fully seen. The pear-shape (1, fig. I.) represented in a few early shields, was soon followed by the flat-iron or heater-shape (2), which prevailed in the 12th and 13th centuries, with an increasing tendency to bulge towards the base, more especially after the introduction of the practice of quartering. When helmet, or helmet and crest, were represented, the shield was often placed in the position called *couché* (3), as if suspended from the helmet by the sinister chief angle. Towards the end of the 15th century appeared such forms as 4 and 5, where the notch is meant to represent a rest for the knightly lance. In the 16th century the forms used became more florid (6), but with considerable variety. The forms in use in the 17th and still more the 18th century, became

gradually more and more tasteless and unmeaning, the least offensive being perhaps the vair-shaped shield (7). In France and Germany the shield most in use is very wide at the base, so as to afford sufficient room for the display of quarterings or small charges. In Spain the favourite type of shield has always been one with rectangular sides and a segment of a circle for the base. The shield of an unmarried lady or widow is of a lozenge-shape (8).

To facilitate the description, or as it is called blazoning of arms, the different points or positions on the escutcheon have received technical names. English heralds generally enumerate them as nine: A (fig. II.), the dexter chief point; B, the middle chief; C, the sinister chief; D, the honour or collar point; E, the fess point; F, the nombril or navel point; G, the dexter base; H, the middle base; and I, the sinister base point. To these may be added K, the dexter flank, and L, the sinister flank. It will be observed that the dexter and sinister sides of the shield are so called from their position in relation to the supposed bearer of the shield, not of the spectator.

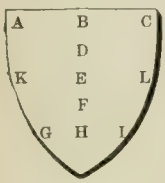


Fig. II.

Tinctures.—Coats-of-arms are distinguished from each other not only by the charges or objects borne on them, but by the colour of these charges, and of the field itself. The field may be of one colour, or of more than one, divided in various ways to be noticed below. *Tincture* is the more proper armorial expression than colour, as the surface of a shield or of an armorial figure may be of a metal, or a fur, as well as of a colour strictly so called.

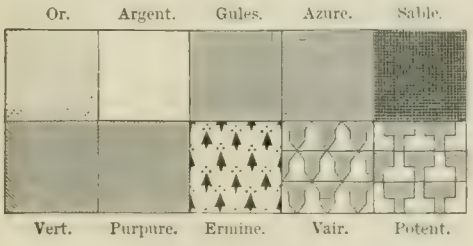


Fig. III.—Tinctures.

The nomenclature of these three classes of tinctures, as of heraldry generally, is an adaptation of Norman-French. The metals in use are two—gold, termed *or*, and silver, *argent*, often represented in painting by yellow and white. The colours are five—red, blue, black, green, and purple, known as *gules*, *azure*, *sable*, *vert*, and *purpure*. A charge represented not of any of these conventional heraldic tinctures, but of its natural colour, is said to be *proper*. In uncoloured heraldic engravings, it has been found convenient to have a mode of representing colours and metals by hatched lines and dots, which is shown in fig. III.; an invention not older than the 17th century. *Or* is represented by dots; for *argent*, the field is left plain; *gules* is denoted by perpendicular, and *azure*, by horizontal lines; *sable*, by lines perpendicular and horizontal crossing each other; *vert*, by diagonal lines from dexter chief to sinister base; and *purpure*, by diagonal lines from sinister chief to dexter base. The original furs in use were *ermine* and *vair*. The former is represented by black spots resembling those of the fur of the animal called the ermine, on a white ground. *Vair*, said to have been taken from the fur of a squirrel, bluish-gray on the back, and white on the belly, is expressed (at least in the more modern heraldry) by blue and white bells or panes in horizontal rows, as shown in the figure. As the number of coats increased, various modifications of these furs were introduced, including *ermines*, or ermine with the field black and the spots white; *erminois*, with the field gold and the spots black; *erminites*, with a red hair on each side of the black spots; *pean*, with the field black and the spots gold. *Potent* is a crutch-shaped form of vair, as represented in the figure, and it also has occasional varieties which need not be noted at length. When vair is composed of any other tinctures than argent and azure, it is blazoned *verry* of these tinctures, and is more strictly a field divided by partition-lines than a fur.

Charges.—Everything depicted on the field of the escutcheon is called a *charge*, and is supposed to stand out in relief on it; and as a general rule, a shield-of-arms has one or more charges. A few exceptional cases occur in continental heraldry of an uncharged shield of one of the metals, colours, or furs; and even in British heraldry there are, as will be seen, cases where a field consisting of metal and colour divided by partition-lines is uncharged. It is an established rule of heraldry that metal should not be placed on metal, nor colour on colour. A remarkable transgression of it occurs in the arms of the kingdom of Jerusalem founded by the Crusaders, which are argent, a cross potent between four crosses or. A recognised exception exists wherever a charge lies over a field partly of metal and partly of colour, or where an animal is (see *infra*) armed, langued, attired, unguled, beaked, membered, crowned, collared, or chained of a different tincture from that of his body. One charge of colour may surmount—i.e. partly cover, another of colour on a field of metal, and the same may happen in case of two charges of metal on a field of colour.

Armorial charges are usually divided into three classes: (1) Honourable ordinaries, figures of simple outline and geometrical form, conventional in character, which in some of the oldest coats are the only charge; (2) Subordinaries or subordinate ordinaries, which differ from the above chiefly in not being generally the recipients of charges, while honourable ordinaries may be and often are charged; (3) Common charges, representations of objects of all kinds, animals, plants, and the whole range of things natural and artificial.

Ordinaries.—The enumeration of the honourable ordinaries by different armorialists is not absolutely identical, some classing as subordinaries figures which others regard as belonging to this class. It may be predicated generally of the ordinaries that they may be borne either simply, along with other charges, charged with other figures, bounded by any of the forms of irregular partition-lines to be noticed below, or combined with each other. Also that they have in most cases their diminutives, which (except in the case of a canton as the diminutive of a quarter) cannot be charged. Taking as our test for admission to this more honourable class the capacity of receiving charges, they may be accounted thirteen in number:

The *Chief* (1, fig. IV.), lying horizontally along the upper part of the shield, and (as also the Pale and Fess) supposed to occupy a third of it. The *Pale* (2), a vertical band in the middle of a shield. It has a diminutive, the *Pallet*, seldom used singly, and a smaller diminutive, the *Endorse*. The *Fess* (3), a horizontal band in the middle of the shield. The *Bar* is a narrower fess, never used singly, and there are further diminutives, the *Closet* and *Barrulet*. The *Bend* (q.v.) (4), a band crossing the shield from dexter chief to sinister base; when charged it occupies one-third, and when plain one-fifth, of the field. It has for diminutives the

Bendlet, the *Cotise* or *Cost*, and the *Ribbon*. The ribbon is sometimes *couped* or cut short so as not to touch the edges of the shield. The cotise sometimes accompanies the bend in pairs on each side, when it is said to be *Cotised*, and the same term is sometimes applied with less propriety to a fess or chevron accompanied by a pair of its diminutives. The *Bend sinister* (5), a band crossing the shield from sinister chief to dexter base. Its diminutive, the *Baton sinister* (q.v.), couped, and borne over all is a mark of illegitimacy. The *Chevron* (6), a figure composed of two bands or limbs issuing from dexter and sinister base, and meeting about the honour point. Its diminutives are the *Chevronel*, which never appears singly, and the *Couple-close*, which sometimes accompanies the chevron in pairs, one on each side. The *Cross* (7), of the form of the Greek cross, with equal limbs.

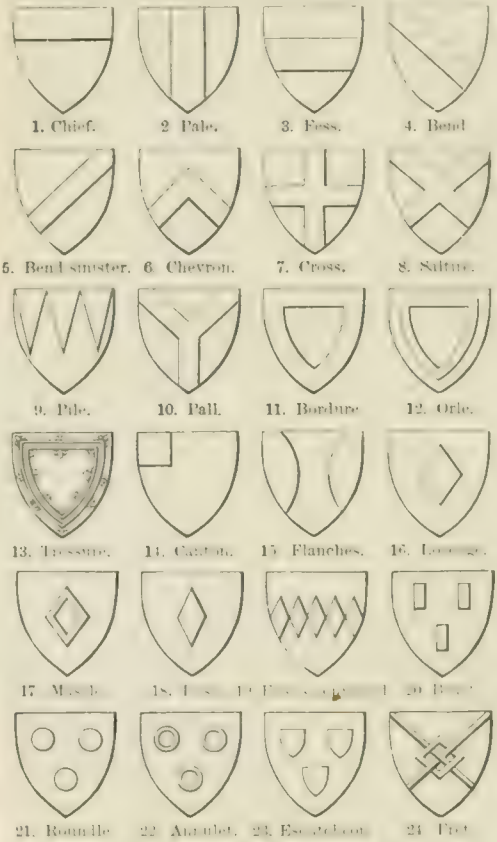


Fig. IV.—Ordinaries and Subordinaries.

It has numerous varieties, most frequently borne in numbers or with other charges, for which see Cross. Any of them is said to be fitchée when its lower limb terminates in a sharp point. The *Saltire* (8), a St Andrew's Cross, or combination of the bends dexter and sinister, often borne along with a chief in the heraldry of Scotland. The *Pile* (9), a triangular wedge-shaped figure, issuing usually from the chief with point downwards. Three piles are often borne together. The *Pall* (10), the upper part of a saltire combined with the lower part of a pale. A variety of it, couped and pointed at the extremities, occurs in Scotland under the name of a *Shakefork*. The *Bordure* (11), a border surrounding the shield, sometimes used as a principal figure, sometimes as a difference. The *Orle* (12) and the *Tressure* (13) are sometimes classed as its diminutives. The former is a narrower bordure detached from the edge of the shield. The latter, borne double and flowered and counterflowered with fleurs-de-lis, occurs in the royal shield of Scotland, and is a bearing greatly esteemed in Scottish heraldry. The *Quarter* is the upper dexter fourth part of the shield, cut off by a vertical and a horizontal line meeting in the fess point. The *Canton* (14), of more frequent occurrence, is a smaller figure like it, and also in dexter chief, unless otherwise specified. The half of a canton parted per bend is called a *Gyron*, chiefly known in British heraldry as giving its name to the field *Gyronny*. *Flanches* (15), borne in pairs, are projections from each flank of the shield bounded by a segment of a circle. Their diminutives are *Flasques* and *Voiders*.

Subordinaries. The subordinaries (excluding those here included in the category of honourable ordinaries) are: The *Lozenge* (16), a rhombus with the acute angles at top and bottom. The *Mascle* (17), a lozenge deprived of the middle part. The *Fusil* (18), an elongated lozenge. Several fusils are sometimes *conjoined en fess* (19), as in the coat of Percy. The *Billet* (20), an oblong figure placed perpendicularly. The *Roundle* (21), a circular disc or knob. Roundles have, in English heraldry, specific names in respect of their tinctures. A roundle or is called a *Bezant*; argent, a *Plate*; gules, a *Torteau*; sable, a *Pellet* or *Ogress*; vert, a *Pomme*. The *Annulet* (22), sometimes regarded by armorialists not as a ring but as a pierced roundle. The *Escutcheon* or *Inescutcheon* (23), a representation of a shield the latter name being generally used when there is only one. It is difficult to see on what principle these last two charges are conventional enough to be ranked among the lesser ordinaries. The *Fret* (24), consisting of two narrow bendlets dexter and sinister in saltire, interlaced with a mascle.

Parted Fields.—The field of an escutcheon (and sometimes an ordinary or other charge) may be of two or more different tinctures, divided by

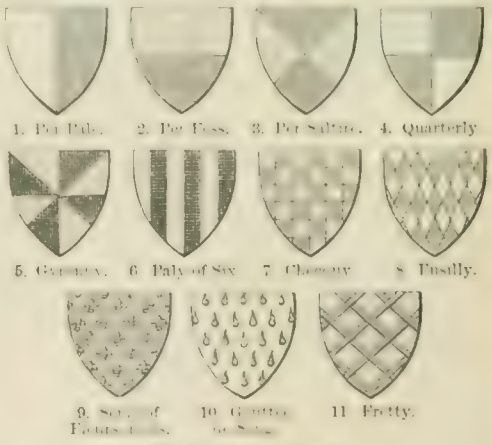


Fig. V. Parted Fields.

one or more partition-lines, and the consideration of partition-lines has here been postponed to this point, as the nomenclature of many of them is derived from that of the ordinaries and subordinaries. When divided by a partition-line in the direction of one of the ordinaries the shield is said to be '*parted* (or *party*) *per* that ordinary,' or simply '*per* that ordinary.' Thus we may have a shield parted per *pale* (1, fig. V.), *fess* (2), *bend*, *chevron*, or *saltire* (3). A shield divided in the direction of a cross is said to be quartered or parted

quarterly (4); parted both per cross and per saltire it is called *Gyronny of eight* (5), the well known bearing of the Campbell family. A shield divided into any number of parts by lines in the direction of a pale, bend, bar, or chevron, is said to be *Paly*, *Bendy*, *Barry*, or *Chevronny*, the number of pieces being specified, as in the example (6), paly of six or and sable (Athole). A field divided into square or oblong panes or pieces by vertical and horizontal lines is said to be *checquy*, as the ancient coat of Warren, checquy or and azure panes (7). A field divided into lozenge-shaped, mascle-shaped, or fusil-shaped panes is described by the term *lozengy*, *mascally*, or *fusilly*. Fusilly argent and gules (8) is the coat of the Grimaldis, princes of Monaco.

A field strewed with an indefinite number of small charges so as to produce the effect of a pattern is said to be *semé* (sometimes aspersed or powdered) of that charge, as France ancient, azure, semé of fleurs-de-lis or (9). When bestrewed with an indefinite number of bezants, billets, cross crosslets, or drops, it is called *bezanty*, *billetty*, *crusilly*, or *gouttée*. English heraldry attaching a specific term to drops of separate tinctures—i.e. gouttée d'eau (water, tinctured argent), de sang (blood, gules, 10), de larmes (tears, azure), de poix (pitch, sable), &c. *Fretty* (11) is when a field is covered with a pattern of interlaced fillets placed diagonally, and leaving open spaces between them.

Partition-lines are not always straight. Fig. VI. represents the commonest forms of irregular partition-lines in use—viz. the *engrailed*, *invected*, *wavy*, *nebulé*, *embattled*, *indented*, and *dancetté*, names equally applicable to the boundary-lines of ordinaries. An ordinary engrailed has the points of the engrailed line turned outwards, and an ordinary invecked inwards. When a fess or chevron is said to be embattled, it is only the boundary-line on the upper side that is of this form. Dancetté differs from indented by the partition-line having larger and fewer indentations.

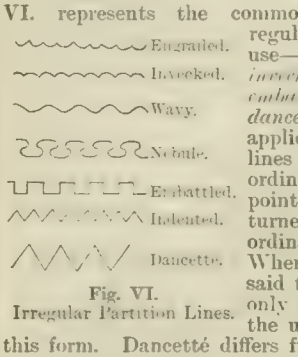


Fig. VI.
Irregular Partition Lines.

Common Charges.—These are representations, more or less conventional, of familiar objects. The knights, in the early days of heraldry, ransacked the animal and vegetable kingdom and the whole range of objects, natural and artificial, for charges that would be distinctive; of which only a few of the most frequent, and those whose nomenclature or treatment is somewhat technical, can be here noticed.

Of beasts which occur in coat-armour, the most important, both in earlier and in later heraldry, is the *Lion*. Its earliest known occurrence is on the seal of Philip I., Duke of Flanders, in 1164; and before long the king of beasts was borne by a large number of the potentates of Europe. The lion is made to assume a variety of positions, a few of which are represented in fig. VII. Its original and normal attitude is *rampant* (1)—i.e. in an erect position with the left hind-leg resting on the ground, the head in profile, and the tail elevated over the back. *Rampant gardant* (2), the same with the head affrontée (looking out of the shield); *regardant* (3), the same looking backwards. *Passant* (4), walking, three paws resting on the ground, the dexter forepaw elevated, the head in profile looking forward, and tail elevated over the back; *passant gardant* (5), as the last, but with the head affrontée. A lion *salient* (6) has both hind-legs on the ground, and the fore-legs elevated, as if to spring; and a lion *sejant* (7) is rising to prepare for action. The lion passant gardant is often blazoned as the lion of England; and in times when terms of blazonry were comparatively few, it was known as the *leopard*; there has, in fact, been much controversy as to whether the animals in the escutcheon of England are lions or leopards. Two-headed, bicorporate, and tri-corporate lions occur in heraldry, as also lion-dragons and lion-poissons. There is likewise the celebrated winged lion of St Mark adopted by the republic of Venice, and the two-tailed lion of Bohemia and of Simon de Montfort, Earl of Leicester. In British heraldry lions and other animals always face to dexter unless otherwise blazoned. Two lions placed face to face are called *combatant*, and back to back, *addossé*. Some of the above-mentioned names for the attitudes of the lion are applied to other heraldic animals. Lions and other beasts of prey are said to be *armed* or *langued* of any tincture, when their teeth and claws or their tongue are of that tincture, and in modern English blazon a lion is always presumed to be armed and langued gules unless either himself or the field be gules, in either of which cases he is armed and langued azure. A *demi-lion* (8) is the upper half of the body of a lion with the extremity of his tufted tail. Lions are often crowned, or gorged (collared) with a crown of some sort. Bears, bulls, boars, stags, goats, dogs, foxes, horses, and hedgehogs, and occasionally elephants, camels, moles, apes, bats, and mice occur as heraldic animals. A *stag* when in easy motion is said to be *trippant* (9); he is *at gaze* (10) when a lion would be statant gardant, and he is attired of any tincture when his attires—i.e. his antlers, are of that tincture. Animals that possess horns and hoofs are said to be armed and unguled in respect of them. The heads and limbs of animals are often borne as charges, and may be either *erased*, like the lion's head (11)—i.e. cut off with a jagged edge; or *couped* (12)—i.e. cut straight off. A *leopard's face* (13) shows none of the neck, and fronts the spectator. A *stag's head* borne full faced, with none of the neck seen, is said to be *cabossed* (14). *Boars' heads* (15) are not unfrequent, and *bears' heads* (16), which are usually represented muzzled. Animals in heraldry sometimes assume a conventional form differing widely from the realistic type of the same creature—e.g. the antelope, which has a stag's head, a unicorn's tail, a tusk issuing from the tip of the nose, a row of tufts down the back of the neck, and similar tufts on the tail, chest, and thighs.

Among birds, far the most prominent is the *Eagle* (q.v.), most commonly represented in the conventional attitude known as *displayed* (17), with wings expanded. Being the king of birds, it became, next to the lion, the most favourite bearing of royal personages, and was adopted by the German emperors. The imperial eagle had at first but one head; the *two-headed eagle* (18) appeared in the middle of the 13th century, and occasionally occurs in English heraldry. The allerion and martlet, originally an eagle and a swallow respectively, became in time unreal birds, the one without claws or beak, the other without legs or beak. The falcon, the pelican, the swan, the cock, the raven, the ostrich, the heron, and the parrot or papingoe are all armorial birds. The *pelican* is generally depicted pecking her breast, and when represented in her nest feeding her young with her blood, she is said to be *in her piety* (19). A peacock borne affrontée with his tail expanded is said to be *in his pride*. Birds having the power of flight are, in respect of their attitude, *close*, *rising*, or *volant*.

Fishes and reptiles occur as charges; the former are said to be *naiant*, if drawn in a horizontal, and *hauriant* (20), if drawn in a vertical position.

The *dolphin*, whom naturalists do not acknowledge as a fish, is in heraldry the king of fish, and is very conventionally drawn most usually *embowed* (21)—i.e. with the body bent. It is best known in this attitude as the allusive bearing of the dauphin. The *escallop shell* (22) is a favourite charge, having been the pilgrim's ensign in crusading times. *Serpents* occur in various attitudes, bowed, erect, &c., and in one famous instance (the coat of the Visconti) *vorant* (devouring) a child (23).

Of purely fantastic animals, we have the dragon, griffin, wyvern, cockatrice, unicorn, mermaid, and others.

Man in whole and in his parts also occurs in armory. Argent, a naked man proper, is the coat of the Scottish family of Dalzell, and we have Moors' (generally represented as blackamoors) heads, Saracens' heads, men's hearts, arms, legs, and hands, also that strange heraldic freak, the *three legs conjoined* (24), carried in the escutcheon of the Isle of Man.

To pass to the vegetable kingdom, trees, plants, leaves, and flowers are all usual heraldic charges. *Trees* are often *eradicated* (25), or torn up by the roots, sometimes placed *on a mount* (26), and occasionally *fructrated* of a different tincture. *Garbs* (27), representing sheaves of wheat, are well known

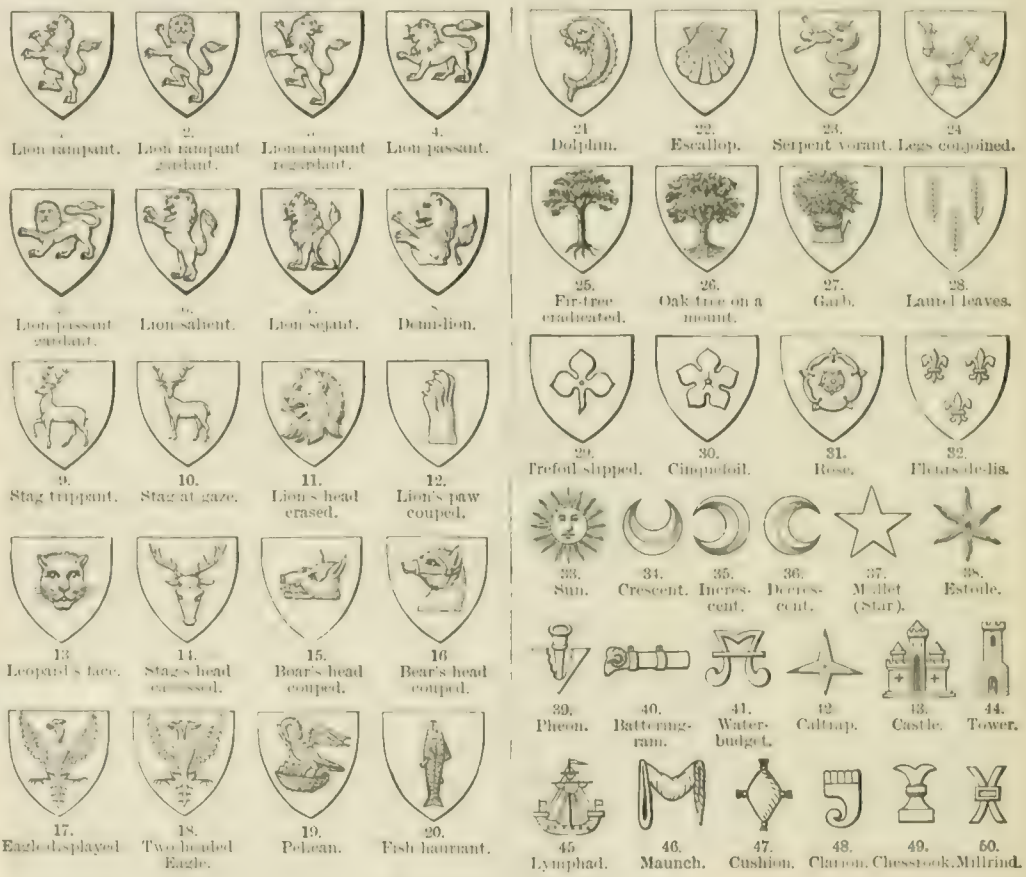


Fig. VII.—Common Charges.

as the arms of the Earls of Chester, of the Grosvenors, and of the Scottish family of Cumyn. *Leaves*, as of the *laurel*, are often borne, like many other charges, in threes (28). A *trefoil*, with three leaflets and a stalk, is said to be *slipped* (29); in the *quatrefoil* and *cinquefoil* (30) the syllable foil means a petal. The *rose* (31) has obtained a prominence in English heraldry from having been the badge of the rival houses of York and Lancaster, and in the conventional representations of it, it has five petals, barbs between them to represent the calyx, and seeds in the centre. It is generally without a stalk, its tincture being either gules or argent, and it is usually barbed and seeded proper —i.e. the barbs are green, and stamina yellow or gold. But of the floral devices of heraldry the most famous is the *fleur-de-lis*, generally identified with the iris, adopted as a badge by Louis VII. of France in 1150, and borne by his son in the form of semé of fleurs-de-lis (9, fig. V.), which became the royal coat of France, till the flowers were reduced to three in number in the reign of Charles VI. (32).

Such charges as swords, scimitars, bows, arrows, helmets, battle-axes, horseshoes, mitres, crosiers, &c. explain themselves. The *sun* surrounded by rays is said to be in his splendour, and generally has a human face (33). A *crescent* (34), representing the moon, has both horns pointed upwards. If the horns are turned to dexter it is called an *increscent* (35); if to the sinister a *decrescent* (36). The *five-pointed star* (37), in the heraldry both of the Continent and of Scotland, represents the heavenly body so called, though not distinguishable from the *mullet* or spur-rowel, except that the latter is sometimes pierced. In modern English heraldry this figure is always styled a mullet, and the *estoile* (38) or star has six or more wavy points. A *pheon* (39) is the head of a dart

barbed and engrailed on the inner side. A *battering-ram* (40) is furnished with an actual ram's head. A *water-budget* (41) represents the bags in which water was stored up and carried across the desert in crusading times. *Caltraps* (see CALTROP) or *chevaltraps* (42) are military instruments for galling the feet of horses. *Castles* (43) and *towers* (44) are not unfrequent, the former very generally triple-towered. An ancient one-masted galley, called a *lymphad* (45), is characteristic of the West Highlands of Scotland. Of charges derived from dress one of the most remarkable is the *maunch* (46), a 12th-century sleeve, borne by the Hastings family. *Cushions* (47) have become famous in Scotland from being borne by Bruce's gallant nephew, Randolph or Ranulph, Earl of Moray, and his descendants. The *clarion* (48) or war-trump is an early English bearing. The *chessrook* (49) or castle in chess is somewhat conventionally drawn. The *millrind* (50) is the iron affixed to the centre of the millstone.

Like medieval architecture, heraldry attained its greatest beauty and purity in the 13th century and first half of the 14th. From that date its early simplicity was gradually departed from: a variety of charges came to be accumulated in one shield, and there was a growing tendency to pictorialism. Trees are represented issuing out of a mount or little green hillock in base (26), and we have also animals walking on a base—i.e. a line cutting off the lower part of the shield. In Wales we have combinations such as a cradle with a child under a tree guarded by a goat, and sometimes in Spain and Italy two animals rampant against a tree, or such scenes as a bloodhound in the act of strangling a boar, or a *serpent vorant* a child (23). In the second half of the 18th century the heraldry of England entered on a singularly degraded and debased stage, far beyond the pictorialisms alluded to, shields being loaded with representations of sea-fights, fortresses, and landscapes, with medals and decorations granted to the bearer of them, setting all heraldic conventionalities at defiance, and dealing in details hardly discernible on the closest inspection. Such charges were habitually granted by way of chiefs of augmentation to the heroes of the old wars. It is to be hoped that the revival of a measure of taste in coat-armour has put an end to them for ever.

Blazonry.—To blazon a coat-of-arms is to describe it in words so precise as to enable any one who has an ordinary knowledge of heraldry to depict it correctly. The following are the principal rules of blazonry. The field must first be named; it may be of one tincture, or an arrangement of more than one (see *ante—Parted Fields*). The charges follow, beginning with those of most importance and nearest the field, their name, number, position, and tincture. An ordinary or a diminutive of an ordinary, except it be a chief, bordure, or canton, generally claims the precedence. When the principal charge is not in the centre of the shield, its position must be described, as De Vere, Earl of Oxford (fig. VIII. 1), quarterly gules and or, in the first quarter a star (mullet) argent. When two or three of the same charge occur, it is understood, unless otherwise specified, that two are placed in pale—i.e. one over the other; and three are disposed, two above and one below; and it is also understood that in case of a fess or a bend between six charges of the same kind, there are three in chief and three in base. In other cases the disposition of the charges must be specified, as *in bend*, *in cross*, *in saltire*, *in orle*: *three*, *two*, and *one*; *four*, *three*, *two*, and *one*, &c. If the ordinary, which is the principal charge, be itself charged, and there are also other charges in the field, the order of the words of blazon will be understood by the following example—Wilmot, Earl of Rochester (2), argent, on a fess gules, between three eagles' heads erased sable, as many escallops or. An exception to the rule that an ordinary or its diminutive is first named, occurs where it debruises or surmounts another charge—e.g. Abernethy (3), or, a lion rampant gules, surmounted by a ribbon

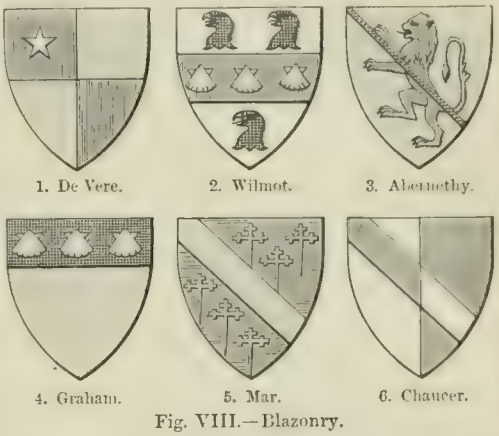


Fig. VIII.—Blazonry.

sable. Generally speaking, a chief, bordure, or canton is mentioned last. When a bordure surrounds a chief, the bordure is named last of all, the reverse being the case when the chief covers the bordure. A bend may surmount a chief, in which case it is mentioned last.

Avoidance of repetition is one of the principles of blazonry. When any tincture has to be repeated, it is on the second occasion described as *of the first*, *of the second*, *of the last*, or *of the field*—e.g. Graham (4), or, on a chief sable, three escallops of the field. Repetition may also be avoided by naming the tincture only the second time—e.g. Mar (5), azure, a bend between six crosslets fitchée or, where the tincture *or* applies to both bend and crosslets.

When the field is of a metal and colour separated by any of the lines of partition, and the charge on it is said to be *counterchanged*, this means that the part of the charge which is on the metal is of the colour, and *vice versâ*, as in the coat borne by the poet Chaucer (6), per pale, argent and gules, a bend counterchanged.

Differencing.—With the advance of the science of arms it became necessary not only to distinguish different families, but to distinguish the different members and branches of a family from each other and from their chief. The head of the house had alone the right to use the pure paternal coat; the cadets had to wear it with a *brisure* or *difference*. There is great variety in the early brisures. A change of tincture, the substitution of one ordinary for another, the debruising of the paternal coat by a bend, the surrounding the arms with a bordure, uncharged or charged, and the addition of part of the coat of an heiress, were all in use as modes of differencing. The differenced coat became an independent heraldic composition, sufficiently like the original arms to indicate the family to which its owner belonged, and also often suggestive of events in the history of the cadet line.

The name of *marks of cadency* has been given to certain small figures which, by a conventional arrangement, indicate the order of descent of the different sons of a family. As systematised about the reign of Henry VII., and in use in modern English heraldry, the marks of cadency are, the *label* (1, fig. IX.) for the eldest son, the *crescent* (2) for the second, the *mullet* (3) for the

third, the *martlet* (4) for the fourth, the *annulet* (5) for the fifth, the *fleur-de-lis* (6) for the sixth, the *rose* for the seventh, the *cross moline* for the eighth, and the *octofoil* for the ninth. The difficulties are obvious of carrying out a system of this kind through all the ramifications of a family for successive generations, even by such devices as charging a crescent with a mullet for the third son of a second son, &c., and the consequence of the supersession in England of all other differences by these figures has been that differencing is much neglected, and remote cadets are often found bearing the arms of the head of their house undifferenced. With the sons and daughters of the royal house of the United Kingdom another usage prevails. They all bear their arms differenced by a label of three points argent. That of the Prince of Wales is plain, those of the younger princes are variously charged.

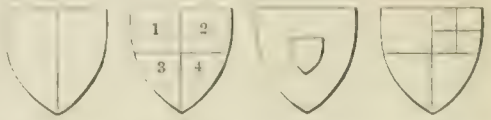
1. Label. 2. Crescent. 3. Mullet. 4. Martlet. 5. Annulet. 6. Fleur-de-lis.

Fig. IX. Marks of Cadency.

The label of the Duke of Edinburgh is charged with a St George's cross in the centre point, and in each of the other points with an anchor azure. The Duke of Connaught substitutes for the anchor a fleur-de-lis azure, and the Duke of Cambridge two hearts in pale gules.

In Scotland, owing perhaps to the wider ramification of the principal feudal families, differencing has been considered of more moment, and is the subject of a separate treatise by the Scottish herald Nisbet. The modern marks of cadency are less in use. The modification of the paternal coat by an additional charge, the engrailing, invecking, &c., of a chief or a partition-line has never fallen out of use. Differencing by a bordure has also been much in favour, a plain bordure of the tincture of the principal charge in the case of a second son, which may be engrailed, invecked, wavy, &c., for cadets branching off in the same generation, and for sub-cadets, parted in different ways, or charged with figures from the maternal coat. With cadets of a later generation the bordures will be of a different colour. Some such system, more or less rigidly observed, runs through the differencing of Scottish coats, which is under the direct supervision of the Lyon Office. For difference designed to illegitimate children, see BATON-SINISTER.

Marshalling of Arms. Marshalling is the proper arrangement of such coats as are to be combined in one shield. In the earlier heraldry it was not the practice to exhibit more coats than one on a shield, but the arms of husband and wife were sometimes placed *accollée*, or side by side in separate escutcheons; or the principal shield was surrounded by smaller ones, containing the arms of maternal ancestors; and we not unfrequently find maternal descent or marriage indicated by the addition of some bearing from the wife's or mother's shield. Then followed *dimidiation*, when the shield was parted per pale, and the two coats placed side by side, half of each being shown. By the more modern practice of *impaling* (1, fig. X.), the whole of each coat is exhibited, a reminiscence, however, of the older practice being retained in the omission of bordures, and occasionally tressures, on the side bounded by the line of impalement. The most common case of impalement in English heraldry is where the coats of husband and wife are conjoined, the husband's arms occupying the dexter side of the shield, or place of honour, and the wife's the sinister side, the impaled coat being personal, and non-descending to the children. The arms of states are sometimes impaled, as were those of England and Scotland in the first and fourth quarters of the achievement of Great Britain from the accession of Queen Anne to the Irish Union. Bishops, deans, heads of colleges, and kings-of-arms impale their arms of office with their family coat, giving the dexter side to the



1. Impaled. 2. Quartered. 3. En Surtout. 4. Counterquartered.

Fig. X.—Marshalling of Arms.

5. Quarterly of six

former. This practice in Scotland, as far as bishops are concerned, belongs only to the post-Restoration episcopacy, as the Scottish sees had no arms till then.

The husband of an heiress (in the heraldic sense) is entitled, according to the more modern usage of British heraldry, to place her arms on a small shield, called an *escutcheon of pretence*, in the centre of his shield, instead of impaling, and in the next generation the arms of the heiress are transferred to one of the quarters of the shield. The escutcheon of pretence is, however, not to be confounded with a small shield of the same kind, called an *escutcheon en surtout* (3), much in use in German, French, and Scottish heraldry, which takes a permanent place in the achievement, and may contain either the paternal arms (as in the Tweeddale branch of the Hay family), some feudal coat, or the coat of an heiress in some past generation, whose memory it has been thought desirable to preserve. It has been the practice for an elected king to place his arms in an escutcheon *en surtout*, the old German emperors placing their family arms on the breast of the imperial eagle.

Quartering, or the exhibiting of different coats on a shield divided both horizontally and vertically, originated in the 13th century, but was little practised till the 14th. The divisions of the shield are called quarters, and are numbered horizontally, beginning at the dexter chief (2). Arms are quartered on various accounts: (*a*) To indicate dominion. A sovereign quarters the ensigns of his different states. On the tomb in Westminster Abbey of Eleanor, daughter of Ferdinand III., king of Castile and Leon, and first wife of Edward I., is the paternal shield of that princess, in which the castle of Castile occupied the first and fourth quarter, and the lion of Leon the second and third. The received rule regarding the quartering of the ensigns of different states is that precedence is given to the most ancient, unless it be of inferior importance. The kings of England, owing to their supposed claim to the French throne, long bore France in the first and fourth quarter, and England in the second and third. In the arms of the United Kingdom, as now borne, England occupies the first and fourth quarter, Scotland the second, and Ireland the third—the relative positions, however, of England and Scotland being reversed on the official seals of Scotland. Feudal arms are sometimes quartered by subjects. Some of the peers of Scotland bear arms of this description. (*b*) Arms of augmentation or special concession accorded to a subject by his sovereign by way of honour, are sometimes granted to be borne quarterly with the paternal coat. These sometimes include a portion of the royal insignia, and have precedence of the paternal coat. (*c*) The most usual reason for quartering is to indicate

descent from an heiress who has married into the family. Where there is but one heiress, her coat occupies the second and third quarters of the shield, and the paternal arms the first and fourth. When there are more than one, they are marshalled in the successive quarters in the order of the intermarriages. Where more than four coats have to be marshalled, the number of vertical lines is increased, and the divisions, though more than four, are still called quarters (5). Where there is an odd number of coats, the last quarter is usually filled up by repeating the first. One of the quarters may itself be quartered, when the heiress was entitled to bear a quartered coat: the shield is then said to be *counterquartered* (4), and its primary quarters are called *grand quarters*. In the course of generations a shield may thus sometimes be inconveniently crowded by the accumulation of coats, including the coats to which each heiress may, in a similar way, have become entitled; and in Germany sometimes above twenty coats (generally coats of dominion) are found marshalled in one escutcheon; but, in British heraldry, families entitled to a number of quarterings usually select some of the most important. A quartered coat may be surrounded by a bordure (for difference), in which case it is treated as one coat.

In the heraldry of the Highlands of Scotland, which is not older than the 16th century, a system of quartering prevailed quite irrespective of family alliance, the quarters being changed under different modifications, with figures partly borrowed from the old monumental sculpture of the country, including the eagle, the fish, the hand with the red cross, and the one-masted galley of Lorne.

The expression 'quarterings' is sometimes loosely used for descents in cases where there is no right to quarter from representation. The eight or sixteen quarterings which in former days were on the Continent essential for the holder of nearly every public office, which were, till lately, often found ranged round the Scottish funeral escutcheon, and which are still important for many purposes in Germany and Austria, have no reference to representation, but imply purity of blood for four or five generations—i.e. that the father and mother, the two grandmothers, the four great-grandmothers, and also, in the case of sixteen quarterings, the eight great-great-grandmothers, have all been entitled to coat-armour.

Other modes of marshalling are in use on the Continent, as the division of a shield per saltire, or into three parts. The marshalling of a coat *en pointe*, or on a triangular figure issuing from the base of the shield, used to be familiar from the escutcheon of Hanover, borne first in the fourth quarter of our royal achievement, and afterwards *en surtout*, where we have Brunswick impaled with Lüneburg, Saxony in base, and over all the crown of Charlemagne, as belonging to the office of arch-treasurer of the empire.

External Ornaments.—Over and above the shield of arms there are certain accessories in use to be represented along with it, and which together with it constitute an *achievement of arms*. These include the helmet, the crest, the motto, the mantling, the supporters, and the crown or coronet.

Before the beginning of the 14th century a helmet began to be placed above shields of arms, the shield being represented in the position called *couchée*—i.e. suspended from the sinister chief angle. After the couchée attitude was abandoned, the helmet resting on the shield began to vary according to the rank of the bearer, the forms adopted being both unbecoming and fanciful. The following are the forms in use in modern British heraldry: (1) that assigned to the sovereign and royal family, which is full faced, of gold, lined with crimson, and with the visor divided by six projecting bars; (2) the helmet of peers, exhibited in profile, with five bars, of which three or four are shown. The helmets of dukes and

1. Sovereign. 2 Peer. 3. Knight. 4 Esquire

Fig. XI.—Helmets.

marquises are entirely of gold, those of earls, viscounts, and barons of steel, with the bars of gold; (3) the helmet of baronets and knights, of steel, full faced, with the visor thrown back, and without bars; (4) the helmet of esquires and gentlemen, in profile, of steel, and with the visor closed. A helmet is never placed over the arms of any woman except the sovereign.

The *Crest* (q.v.) is an ornament of the head rising above the helmet. Crests first appear occasionally on seals and monuments of the 13th century, the earliest being a radiant ornament somewhat like a displayed fan. Originally a special mark of honour worn by heroes of great valour or holding a high military command, the crest became eventually, in English heraldry at least, an inseparable adjunct of the coat-of-arms. An extraordinary number of crests are sometimes accumulated in German achievements, each on its separate helmet. In our modern heraldry the crest is generally placed on a wreath of two pieces of silk of the livery colours—i.e. the first metal and first colour of the shield, but occasionally on a cap of maintenance or a ducal coronet. In the achievement of the sovereign the helmet is placed immediately above the shield, the crown rests on the helmet, and the royal crest rises from the crown. In the achievements of peers, on the other hand, the helmet rises from the coronet, which is placed immediately over the shield.

The *motto* is placed within an escrol either over the crest or below the shield. It bears in many cases an allusion to the family name or arms, or to the crest.

The *mantling* or *lambrequin* is an appendage hanging down from the helmet and passing behind the escutcheon. It is considered to be derived either from the contoise, an ornamental scarf represented in seals and monuments of the 13th and 14th centuries, or from the military mantle or robe of estate. Its comparatively irregular shape in more modern instances has been explained as indicative of the tattered condition to which it has been reduced in the field of battle. Tassels are sometimes appended, and when treated as a robe of estate the bearings of the shield are occasionally repeated on it. In British heraldry the mantling of the sovereign is of gold, lined with ermine; that of peers of crimson velvet, lined with ermine. Knights and gentlemen have either the livery colours of the shield, or, as the practice is in Scotland, crimson velvet lined with silver.

The *Crown* (q.v.), *Coronet* (q.v.), and *Mitre* (q.v.) are adjuncts to the shields of those whose dignity or office entitles them to be thus distinguished.

Supporters.—These figures placed on each side of an armorial shield, as it were to support it, were at first purely decorative, generally, however, having allusion to the arms or descent of the bearer; but they soon came to be considered indicative of his being the head of a family of eminence or distinction. The most usual supporters are animals,

real or fabulous; but men in armour are not unfrequent, as also naked men or savages, often carrying clubs, and wreathed about the head and middle. On early seals a single supporter occasionally occurs, and there are instances of the escutcheon being placed on the breast of an eagle displayed. The dexter and sinister supporters are often, and almost always in continental heraldry, alike. In British heraldry, however, the two supporters are in many cases different; and where the bearer represents two families, a supporter is sometimes adopted from the achievement of each. The rules restricting the right to supporters are different in different countries. In England their use is confined to the royal family, peers, knights of the Garter, and knights Grand Cross of the Bath (with the last the right does not transmit to descendants), the heads of a very few families out of the peerage, who derive their right from an old patent or early usage, and the chief mercantile companies of London. In Scotland the right extends to the chiefs of important clans, and the representatives of minor barons who had full baronial rights prior to 1587, the date of the act which finally excluded the minor barons from parliament. Baronets of Nova Scotia have as such no right to supporters, though many of them bear them in respect of their baronial qualifications. It is considered to be in the power of the Scottish King-of-arms to confer them *ex gratia*, a right which has been sparingly exercised, except for the period between 1790 and 1820.

Any collar and badge of an order to which the bearer may have a right forms properly a part of his achievement, the collar surrounding his shield, and the badge being suspended from it. The badge of Nova Scotia is suspended by an orange tawny ribbon from the shield of baronets of Scotland; and other baronets have the arms of Ulster in a canton or an inescutcheon (see BARONET). Certain officers of state accompany their shields with marks of their rank. The Duke of Norfolk as Earl Marshal places saltirewise, behind his shield two truncheons, tipped above with the arms of England and below with his own arms. The Lord Justice-general of Scotland in like manner places two swords saltirewise behind his shield.

The full achievement of the sovereign of the United Kingdom of Great Britain and Ireland is shown in fig. XII. Its full blazon is: Quarterly,

Fig. XII. Royal Arms of the United Kingdom.

first and fourth gules, three lions passant gardant in pale, or, for England; second, or, a lion rampant within a double tressure flory-counterflory gules, for Scotland; third, azure, a harp or, stringed argent, for Ireland; all surrounded by the Garter. *Crest.*—Upon the royal helmet, the imperial crown proper, thereon a lion statant gardant or, imperially crowned proper. *Supporters.*—Dexter, a lion rampant gardant or, crowned as the crest. Sinister, a unicorn argent, armed, crined, and unguled proper, gorged with a coronet composed of crosses patée and fleurs-de-lis, a chain affixed thereto passing between the fore-legs, and reflexed over the back, also or. *Motto.*—'Dieu et mon Droit,' in the compartment below the shield, with the Union rose, shamrock, and thistle engrafted on the same stem.

This article may appropriately conclude with a short account of the various ways in which the royal arms of England, Great Britain, and the United Kingdom have been borne. The Great Seal of Richard Cœur-de-Lion, made after his return from the third crusade, had the three lions passant gardant (or leopards) in pale, as they have ever since been depicted. In 1340 Edward III., in virtue of the supposed right of his mother, assumed the title of king of France, and quartered the arms of France (azure, semé of fleurs-de-lis or) with those of England, giving the precedence to the former. Richard II. sometimes bore the reputed arms of Edward the Confessor (azure, a cross flory between five martlets or) impaled with his quartered coat, giving the former the precedence. In conformity with the practice in France, the fleurs-de-lis were in the later part of the reign of Henry IV. reduced to three in number. No further change took place in the royal escutcheon until the time of James I., except that Mary, on her second Great Seal, made after her marriage with Philip II., impaled the arms of Spain and England.

James VI. of Scotland, on succeeding to the throne of England as James I., quartered the arms borne by preceding sovereigns with those of Scotland and Ireland, the first and fourth quarters being counterquartered France and England, the second quarter being the lion rampant of Scotland; the third, the harp of Ireland. The royal arms were borne similarly by all the sovereigns of the House of Stuart until the reign of Anne, except that William III. bore *en surtout* the coat of Nassau: azure, semé of billets, a lion rampant or. In the reign of Anne the legislative union with Scotland brought about a further change; England impaled with Scotland was placed in the first and fourth quarter, France in the second, and Ireland in the third. The accession of George I. displaced England and Scotland from the fourth quarter, to make way for the arms of Hanover (see *ante—Quartering*). In 1801 George III. laid aside the titular assumption of king of France, and abandoned the French fleurs-de-lis. The arms of England were now made to occupy the first and fourth quarter, Scotland the second, and Ireland the third, while the arms of Hanover were placed *en surtout*. These last were finally abandoned on the severance of Hanover at the accession of Queen Victoria, when the royal escutcheon assumed its present arrangement.

The lion passant (or statant) gardant as the *crest* of England first appears on the Great Seal of Edward III. The supporters borne in former times by the kings of England varied much, particularly during the early period when these appendages of the shield were invested with more of a decorative than an armorial character, and perhaps often left to the fancy of the engraver. When the arms of any of the English sovereigns from Richard II. to Edward IV. are represented with supporters, the animals chosen are almost indifferently lions, antelopes, or white harts, and occasionally their place is supplied by angels. Edward IV.'s shield is sometimes supported on one side by a black bull,

and that of Richard III. in one instance by white boars. During the reigns of Henry VII., Henry VIII., Edward VI., Mary, and Elizabeth, the lion, red dragon, and greyhound were the animals most in vogue; the herald or engraver generally choosing as it suited him two out of the three. James I. for the first time clearly defined the royal supporters, adopting the lion of England and unicorn of Scotland as they have ever since been borne.

At the union of 1603 a different mode of marshalling from what has been described was allowed in Scotland, the arms of that kingdom occupying the first and fourth quarter, and England being relegated to the second. The Act of Union of 1707 contains no provision for the continuance of a special mode of marshalling for Scotland; but the various official seals of Scotland have uniformly reversed the places of England and Scotland, giving precedence to the latter. The royal arms, as borne in Scotland, are also in use to be encircled with the collar of the Thistle outside the Garter. The Scottish crest takes the place of the English, and the unicorn supporter takes precedence of the lion, the former being crowned and gorged with an antique crown.

The full blazon of the old royal arms of Scotland is as follows: Or, a lion rampant gules, armed and langued azure, within a double tressure flory-counterflory of fleurs-de-lis of the second. *Supporters.*—Two unicorns argent, imperially crowned, armed, crined, and unguled or, gorged with open crowns, with chains affixed thereto, and reflexed over the back, of the last. *Crest.*—Upon the imperial crown proper, a lion sejant affrontée gules, crowned or, holding in the dexter paw a sword, and in the sinister a sceptre, both proper. *Mottoes.*—'Nemo me impune lacessit,' and, over the crest, 'In Defence.'

Among standard works on heraldry are Guillim's *Display of Heraldry* (editions of 1610 and 1724); Edmonson's *Complete Body of Heraldry* (1780); Sir George Mackenzie's *Science of Heraldry treated as part of the Civil Law and Law of Nations* (1680); Nisbet's *System of Heraldry* (1722–43; reprinted 1810); De la Colombière's *Science Héroique* (1669); various French treatises of Ménestrier (1671–80); Spener's *Opus Heraldicum* (1690); and the *Nurnberger Wappenbuch*. Among modern treatises: Planché's *Pursuivant of Arms*; Montagu's *Heraldry*; Boutell's *Heraldry, Historical and Practical* (1864); Seton's *Heraldry in Scotland* (1863); Burke's *General Armory*; Bouton's *Traité de Blazon* (1863); Rielstap's *Armorial Général* (Gouda, 1884); *L'Art Héraldique*, by Gourdon de Genouillac (1889); F. E. Hulme's *Heraldry* (1891); and *A Treatise on Heraldry, British and Foreign*, by the Rev. J. Woodward and the writer of this article (2 vols. 1892).

Herat', capital of the most westerly of the three divisions of Afghanistan, stands on the Hari-Rud, at the height of 2500 feet above the sea, in 34° 50′ N. lat., 62° 30′ E. long.; distance from Kabul, 390 miles west. Situated near the boundaries at once of Afghanistan, Persia, and the Transcaspian district of Russian Turkestan, Herat is one of the principal marts of Central Asia, carrying on at the same time extensive manufactures of its own in wool and leather. The vicinity, naturally fertile, has been artificially rendered much more so by means of irrigation, drawn from the Hari-Rud and its tributaries. Owing to this abundance in water, Herat and its district has been at all times famous for its rich crops and excellent fruits, in fact it has been the granary of the north-western portion of Afghanistan and of the adjoining Turkoman country. But the city claims notice mainly on political and military grounds. Long the royal seat of the descendants of Timur, and often a bone of contention between the warlike tribes all round, it is fortified by a ditch and wall, and is commanded on its north side by a strong citadel built under the direction of British officers, amongst whom the late Sir Eldred Pottinger occupied a pre-eminent place. In 1885–86 the fortifications of Herat were examined and armed by the military members of the Afghan Boundary Commission. In modern times the place has acquired a kind of European importance, being, towards Persia and Russia, the key of Afghanistan, which country in turn affords the only approach by land to western India. In this connection Herat has been viewed as an outpost of England's eastern empire against Russian intrigue and encroachment. Hence it has been alike the subject of treaties and the occasion of wars between Great Britain, as the mistress of India, and Persia, as virtually a vassal of Russia. This feature of the history of the city was more specially developed in connection with the last conflict between Persia and England. In November 1856 the Shah, regarded by the British government as a vassal and agent of the Czar, captured Herat, while actually conducting negotiations for an amicable adjustment at Constantinople; but he was within a few months constrained to relinquish his prey and renounce his claims by a British expedition directed against the opposite extremity of his empire. Since Russia, after subduing the Tekke Turkomans and after having annexed the oasis of Merv (1884), pushed her frontiers as far as Chihl Dukhteran and Kosh Assiah, which is from 30 to 40 miles distant from the gates of Herat, the political importance of the place has grown immensely, and Herat is actually the pivot of the whole Central Asian question. From a commercial point of view Herat has been at all times an emporium for the trade between Central Asia, Persia, and India, as the caravan roads leading from the Oxus and from the Indus towards Persia and Western Asia had found here their point of junction. Indigo, dried fruits, dyes, asafœtida, rice, wool, carpets, raw hides, silk, and leather wares are the chief items of export, whilst chintzes, cloth, sugar, ironwares, and European arms are imported from the West, and quite recently to a large extent from Russia. In 1890 it was in contemplation to bring Herat into railway connection either through a branch-line coming from the Transcaspian railway from Dushak *viâ* Sarakhs in the north, or *viâ* Kandahar from the south, in which case Herat will again acquire its ancient importance from a commercial point of view. The town, famous in the time of Sultan Husein Baikara for its splendid buildings, is to-day a heap of ruins, out of which the citadel, the Charsu, the Tuma Musjid, and parts of the Musallah are prominent as remnants of a bygone glory. The population, consisting chiefly of Persians, Tajiks, and Chihar Aimaks—Afghans constitute only the garrison—has fluctuated within the century from 100,000 to 10,000; the average pop. now being about 30,000. See Malleson's *Herat* (1880); Yate's *Northern Afghanistan* (1888).

Hérault, a maritime department in the south of France, bounded on the south-east by the Gulf of Lyons, is oval in form, 84 miles in greatest length from east to west, and has an area of 2393 sq. m. Pop. (1872) 429,878; (1891) 461,651. It is occupied in the north and north-west by chains of the Cevennes; but the mountainous tracts give place to low plains as the coast is approached, and these in turn to salt-marshes and lagoons next the sea. The largest of the lagoons (*étangs*), Thau, covers nearly 20,000 acres. The principal rivers are the Hérault, the Orb, and the Lez, which rise in the Cevennes and pursue a generally southward course to the Mediterranean. In the neighbourhood of the *étangs* the climate is unhealthy, especially in summer, when agues and fevers prevail; but elsewhere throughout the

department it is unusually fine, though in summer very hot and dry. About a fourth of the entire area consists of arable land. Previous to the devastating attacks of the phylloxera, this department was counted amongst the most important of the wine-growing districts of France. The acreage planted with vines has in ten years decreased from 480,000 to 154,000 acres, and the yield of wine from 390 to about 125 million gallons. The cultivation of olives and the breeding of silkworms and sheep are important industries, as are also the preparation of brandy and liqueurs, the manufacture of cloth, glass, soap, and candles, and tanning. Coal is the chief mineral mined. Large quantities of salt are prepared from the saline marshes; and from the shore lakes and the sea immense quantities of fish are obtained. This department is divided into the four arrondissements of Béziers, Lodève, Montpellier, and Saint-Pons. Montpellier is the capital.

Herbal, originally a book containing an account of all known plants with their medicinal properties, is now a book containing descriptions only of those plants which possess medicinal properties. See PLANTS, Vol. VIII. p. 222.

Herbarium, or HORTUS SICCUS ('dry garden'), a collection of specimens of dried plants, intended for the future study and examination of botanists. Specimens intended for the herbarium should be as perfect in all their parts as possible. They are laid between layers of blotting or botanical paper, and subjected to pressure to dry them. The pressure should be light at first, but increased as the process of drying goes on. The paper requires to be changed frequently—daily in the case of succulent specimens. Special methods have to be adopted in the case of very succulent specimens, such as orchids, &c.: only very slight pressure must be given; and subjecting them to constant uniform heat, as in hot sand, placing them in an oven, or suspending and turning them before the fire, enveloping them first of course in paper, indicate some of the modes of proceeding with such-like specimens. When dried they are mounted on paper, and, if they are to be of any scientific value, the generic and specific names of each should be attached, along with all other data bearing on its identity, such as habitat, &c. Care must be taken to preserve specimens from the ravages of moths and beetles by frequent inspection, by the aid of camphor, and by the occasional application of a little corrosive sublimate.

Herbart, JOHANN FRIEDRICH, a German philosopher, was born at Oldenburg, May 4, 1776. At a very early age he was familiar with religious and metaphysical doctrines and discussions, and in his eighteenth year he became the pupil of Fichte at Jena. In 1805 he was appointed extra-ordinary professor of Philosophy at Göttingen; in 1809 he went to Königsberg as Kant's successor; but in 1833 returned to Göttingen, where he remained till his death, August 14, 1841. His collected works were published by his scholar Hartenstein (12 vols. 1850–52; new ed. 1883 *et seq.*).

Herbart starts from the Kantian position by analysing experience. In his system logic, metaphysics, and æsthetics rank as co-ordinate elements. Logic deals with the formal elements of thought, metaphysics and æsthetics with its content. Of these two the former investigates those of our empirical conceptions which are given us in experience, and which cannot be alienated from our thought, whilst the latter deals with those conceptions which involve judgments of approval or disapproval. The most characteristic features of his thinking are, however, these. He posits a multiplicity of 'reals,' or things which possess in themselves absolute existence apart from apperception by the mind of man. He rejects the notion of separate mental faculties, substituting in their place the conception of primordial presentations or forces, from whose action and interaction all psychical phenomena result. From the conditions which determine the equilibrium and movement of these presentations he deduces a statics and a dynamics of mind, both amenable to mathematical manipulation, and thus introduces psychology to a place among the exact sciences. Ethics he ranks as a branch of æsthetics; it investigates the agreement or disagreement between volition and the fundamental moral ideas.

His works on the science of education have a peculiar value, and have been much studied of late. See books on Herbart by Thilo (1875), Zimmermann (1877), and Wagner (7th ed. 1894); De Garmo, *Herbart and the Herbartians* (1895), the translation of Herbart's *Science of Education* by Mr and Mrs Felkin (1895); and Ufer's *Pedagogy of Herbart* (trans. 1896).

Herb Christopher. See BANEBERRY.

Herbelot, BARTHELEMY D' (1625–95), orientalist, was born in Paris, and became (1692) professor of Syriac in the Collége de France. His *Bibliothèque Orientale*, was published after his death by Galland (1697; 3d ed. 4 vols. 1777–83). It is a universal dictionary of all knowledge known to the Orient, and is principally based upon the Arabic work of Hajji Khalfa; although lacking in critical accuracy, it is full of important information for those who do not read Arabic and other oriental tongues.

Herbert. Herbert Fitz-Herbert was chamberlain and treasurer to King Henry I. Seven or eight generations later, we find the Herberts diverging into several distinct branches, including the lines of the Earls of Powis (now extinct in the male line), of the Lords Herbert of Cherbury (also extinct), the Herberts of Muckross, and also several untitled branches which have flourished upon their ancestral lands in England, Wales, and Ireland. In the reign of Henry V. Sir William Herbert of Raglan Castle, County Monmouth, received the honour of knighthood in reward of his valour in the French wars. His eldest son, a staunch adherent of the House of York, was created Earl of Pembroke by Edward IV. in 1468, but fell into the hands of the Lancastrians after the battle of Danesmoor, and was beheaded the following day. His son became Earl of Huntingdon.

The title of Earl of Pembroke was restored to the Herberts in 1551 in the person of the son of an illegitimate son of the first earl. The new earl was one of the most influential noblemen of his age, and one who took an active part in public affairs, both as a statesman and a soldier. By his wife, who was a sister of Catharine Parr (the last queen of Henry VIII.), he had a son Henry, second earl, to whose countess, Mary ('Sidney's sister, Pembroke's mother'), Sir Philip Sidney dedicated his *Arcadia*. It has been attempted to identify Shakespeare's 'W. H.,' the 'only begetter' of the *Sonnets*, with the third earl, who succeeded in 1621. The fourth earl, some time Lord Chamberlain to Charles I., and Chancellor of the university of Oxford, was also Earl of Montgomery. The eighth earl held several high offices under Queen Anne, including that of Lord High Admiral. Lord Herbert (q.v.) of Lea was a younger son of the eleventh earl; and his son became (1862) thirteenth Earl of Pembroke, and tenth Earl of Montgomery. The Earls of Carnarvon, more than one of whom have gained celebrity in the field of literature, descend from the eighth Earl of Pembroke mentioned above. The recent Earls of Powis are descended from the same stock maternally, the only child and heiress of the last Earl of Powis of the Herbert

stock having married the eldest son of the illustrious Lord Clive, in whose favour that title was renewed in 1804.

Herbert, Edward, Lord Herbert of Cherbury, soldier, statesman, poet, and philosopher, was born of the ancient and noble House of Herbert, apparently on the 3d March 1583, at Eyton in Shropshire. He was sent to Oxford in his twelfth year, and before he had quite quitted his studies he married an heiress considerably older than himself. On the occasion of the coronation of James I. he was made a knight, and invested with various offices. He left home, accordingly, for France in 1608, and in Paris lived in terms of intimacy with the Constable Montmorency, Isaac Casaubon, and other distinguished men. After a brief return to his native country, he set out again in 1610 for the Low Countries, where he joined the arms of Maurice of Orange; and he again offered him his services in 1614. After a campaign, he travelled through Germany and Italy on horseback, and went as far as Venice, Florence, and Rome. On his way back he got into trouble through an attempt which he made to raise a troop of Protestant soldiers in Languedoc for the Duke of Savoy. Shortly after, he returned to England, and was made a member of the Privy-council; then sent to France, first as extraordinary ambassador, and then as ordinary ambassador. He tried, but without much success, the difficult task of negotiation between Louis XIII. and his Protestant subjects, was ultimately dismissed, and in spite of eager solicitation never received any further appointment. He was elevated first to be a peer of Ireland, and then in 1629 to be a peer of England, with the title of Baron Herbert of Cherbury. When the Civil War broke out he at first sided with the royalists, but ultimately surrendered his castle to the parliamentarians, with whom he afterwards lived on easy terms. He was commonly regarded as having saved his possessions at the expense of his honour. He died in London, 20th August 1648.

The work by which Herbert, the friend of Donne, Selden, Ben Jonson, Grotius, and Gassendi, was best known to his contemporaries is his *De Veritate* —an anti-empirical theory of knowledge, which in many respects anticipates the common-sense philosophy of the Scottish school, and is at times even Kantian. His *De Religione Gentilium* (1663) is a 'natural history of religion,' by means of which Herbert finds that all religions, amidst their extravagances or follies, recognise what were for him the five main articles of religion—that there is a supreme God, that he ought to be worshipped, that virtue and purity are the main part of that worship, that sins should be repented of, and that there are rewards and punishments in a future state. In virtue of this 'charter of the deists,' Herbert is not unjustly reckoned the first of the deistical writers. The *Expeditio Buckinghami Ducis* (1656) is a vindication of his patron's ill-fated expedition. The ill-proportioned *Life and Raigne of King Henry VIII.* (1649) glorifies Henry overmuch, and is by no means accurate. His best-known work, the *Autobiography*, a brilliant picture of the man and of contemporary manners, may fairly be regarded as a masterpiece in its kind; but it is disfigured by overweening conceit and self-glory in his own personal beauty, noble blood, valour in Quixotic duels, favours from famous ladies, and generosity, and is not to be regarded as veracious. It comes down only to 1624. The *Poems*, Latin and English, which may be divided into sonnets, elegies, epitaphs, satires, miscellaneous lyrics, and occasional pieces, reveal in their author a representative of Donne's, or the 'metaphysical,' school; many, in the judgment of a recent editor, are of real and true poetry, in some respects resembling Browning, in some anticipating Tennyson. See Rémusat's monograph on Herbert (Paris, 1874); Churton Collins's edition of the Poems (1881); and Sidney L. Lee's edition of the Autobiography, with introduction and continuation (1886).

Herbert, George, an English poet, was born in Montgomery Castle, in Wales, on the 3d April 1593. His family was a younger branch of that of the Earls of Pembroke. His eldest brother was Lord Herbert (q.v.) of Cherbury, who says of him: 'My brother George was so excellent a scholar that he was made the public orator of the university of Cambridge, some of whose English works are extant, which, though they be rare in their kind, yet are far short of expressing those perfections he had in the Greek and Latin tongue, and all divine and human literature. His life was most holy and exemplary, in so much that about Salisbury, where he lived beneficed for many (?) years, he was little less than sainted. He was not exempt from passion and choler, being infirmities to which our race is subject; but, that excepted, without reproach in his actions.' George Herbert's mother was a Newport, of the old Shropshire family of the Newports of High Ercall. She was left a widow, and devoted herself to the education and training of her seven sons, in which effort she was singularly successful. Her memory has come down to us as one of those many mothers of the English race to whom it owes so much. Under her influence and that of Dr Neville, Dean of Canterbury and Master of Trinity College, Cambridge, the foundations were laid of a character of almost perfect beauty. In 1614 George Herbert was elected Fellow of his college, and in 1619 promoted to the office of Public Orator, in which place he continued eight years, and, as Izaak Walton says, 'managed it with as becoming a grace and gaiety as any had ever before or since his time.' 'If during this time,' he continues, 'he expressed any error, it was that he kept himself too much retired, and at too great a distance from all his inferiors, and his clothes seemed to prove that he put too great a value on his parts and parentage.' The antecedents of his family, indeed, and his position at the university, naturally led him to expect advancement at court; but on the death of King James his thoughts became more decidedly drawn towards a distinctly religious life—a life which his mother had always wished him to follow. After a period of seclusion in the country, he finally decided to relinquish all expectation of court favours, and to devote himself entirely to the religious life. In 1626 he was made prebendary of Layton Ecclesia in the diocese of Lincoln, and in 1630, the year after his marriage to a kinswoman of the Earl of Danby and daughter of Mr Charles Danvers of Bainton, Wilts, he was presented, by the favour of his kinsman the Earl of Pembroke, to the vicarage of Bemerton, near Salisbury; Charles I. saying, when the earl solicited the presentation which had lapsed to the crown, 'Most willingly to Mr Herbert, if it be worth his acceptance.' He only enjoyed this vicarage for three years, being buried on 3d March 1633: yet in that short time he left a memory which still survives. No one who reads his *Country Parson*, a description of an ideal parson's life, which is doubtless to a considerable extent a picture of his own life and conduct, will be surprised at this fact. Walton says of him, 'his aspect was cheerful, and his speech and motion did both declare him a gentleman; for they were all so meek and obliging that they purchased love and respect from all that knew him.' He was naturally the intimate of the most cultured natures of his day, but the reality of religious life led him, as it

has done others, to a perfect sympathy with the uncultured and the ignorant. He was an accomplished musician, who recognised in music not a science only, but a divine voice; and his poetry is the natural result of his training and of his life. It exhibits a singular combination of the attributes of a courtier, a gentleman, and a saint. It manifests a knowledge of life, and of the world, and a certain strength and force of thought and of expression which has made his verses the favourite reading of men who are not generally attracted to sacred and devotional poetry; and this quality will probably ensure for his poems a lasting, though perhaps limited, number of students and admirers.

See his *Works in Prose and Verse*, with Life by Walton, and notes by Coleridge (1846); editions by Nichol (1863) and Grosart (1876); the present writer's preface to *The Temple* (1882); and a new *Life* (S.P.C.K., 1893).

Herbert, Sidney, Lord Herbert of Lea, minister and statesman, was the son of the eleventh Earl of Pembroke by his second wife, the daughter of Count Woronzow, and was born at Richmond, 16th September 1810. Educated at Harrow and at Oriel College, Oxford, he devoted himself to public life, and entered the House of Commons in 1832 as member for South Wilts, which he represented until his elevation to the peerage in 1861. He began his political career as a Conservative, and was Secretary to the Admiralty in Sir R. Peel's administration from 1841 to 1845, when he became Secretary-at-war. It fell to him to oppose Mr Cobden's motion for a select committee to inquire into the effect of the corn laws. He went out of office with his party in 1846. In 1852 he was again Secretary-at-war, under the Aberdeen ministry, and, in consequence, the 'horrible and heart-rending sufferings' of the army before Sebastopol were laid in a great degree at his door. He was for a few weeks Colonial Secretary in the first administration of Lord Palmerston in 1855, and Secretary-at-war in his second administration in 1859. Great improvements in the sanitary condition and education of the army, the amalgamation of the Indian with the royal army, and the organisation of the volunteer force signalised his army administration. He largely reformed the War Office, and was devoting himself with equal zeal and intelligence to his ministerial duties when, owing to failing health, he resigned his seat in the House of Commons, and in 1861 was called to the Upper House, under the title of Baron Herbert of Lea. He died August 2, 1861. He was heir-presumptive to the earldom of Pembroke, and his son (1850-95, author of *South Sea Bubbles*) became in 1862 thirteenth earl.

Herb Gerard. See Bishopweed.

Herbivora ('plant-eaters'), in some of the classifications of the Mammalia, has been regarded as an order (co-ordinate with Carnivora), and by some been divided into Artiodactyla and Perissodactyla. See Mammalia, Ungulata.

Herb Paris. See Paris.

Herb Robert. See Geranium.

Herbs, or Herbaceous Plants, are those which do not form a *persistent* woody stem above ground. They are annual, biennial, or perennial. An annual springs from seed, blossoms and dies in one season. A biennial vegetates only during the first growing season, and stores up nourishment in its root-stock which persists through the winter; during the second growing season the root-stock sends up flowering shoots, and after fructification the whole plant dies. When the root-stock perennates, and only the aerial shoots die at the end of each growing season, the plant is perennial. See Pot-herbs.

Herculaneum, an ancient city of Italy, so called from the local worship of Hercules, was situated at the north-western base of Mount Vesuvius, about 5 miles E. of Naples. Considerable obscurity envelops its early history; it is supposed, however, to have been of Phœnician origin, and to have been occupied afterwards by Pelasgians and Oscans. It subsequently was conquered, with all the rest of Campania, by the Samnites, and later it fell into the hands of the Romans. In 63 A.D. the city was seriously injured by a violent earthquake; and in 79 it was buried, along with Pompeii and Stabiæ, by the memorable eruption of Vesuvius (q.v.) which took place in that year. It now lies at a depth of from 40 to 100 feet below the surface, and is filled up and covered with volcanic tufa, composed of sand and ashes, and consolidated to some extent by water, which is often thrown up in great quantities during volcanic eruptions. Above it, on the modern surface, are Portici and Resina, two villages now absorbed in the suburbs of Naples. In 1706, on the occasion of deepening a well, fragments of mosaics were first brought up; but little was done for systematic excavation till 1738, when explorations were commenced under royal authority. It was then discovered that the building near the bottom of the well, from which the first relics were obtained, was the theatre. This building was forthwith explored and cleared, and several statues, both in bronze and marble, were extracted from it. Excavations were carried on but to a limited extent, not only in consequence of the hardness of the tufa, but from the fear of undermining the dwellings on the surface. Hence but a portion of this entombed city is yet visible, the chief edifice shown being still the theatre, which had been built a short time before the fatal eruption. It has eighteen rows of stone seats, and could accommodate 8000 persons. Part of the Forum with its colonnades, a colonnade

General view of the Excavations at Herculaneum.

(mistaken at first for a basilica), two small temples, and a villa have also been discovered; and from these buildings many beautiful statues and remarkable paintings have been obtained. Of late years excavations have been resumed under government, with important results, particularly as to the plan of Herculaneum, and in 1880 ruins of extensive baths and of the accessory buildings were brought to light. A general view of the exposed city (1889) is given from a photograph. Among the art-relics of Herculaneum, which far exceed in value and interest those found at Pompeii, are the statues of Æschines, Agrippina, the Sleeping Faun, the Six Actresses, Mercury, the group of the Satyr and the Goat, the busts of Plato, Scipio Africanus, Augustus, Seneca, Demosthenes, &c. These treasures, together with such vases and domestic implements as have been found, are on view in the National Museum at Naples. For the classical student *La Villa Ercolanese dei Pisoni*, by Comparetti and De Petra (Turin, 1883), is recommended.

Hercules (Gr. *Hēracles*), the beloved son of Zeus by Alcmene (of Thebes), was intended by his father to be king of the Argives; but Hera, the jealous spouse of Zeus, by a trick caused Eurystheus to become king of Argos. Nor was her wrath satisfied with this; she made Hercules serve Eurystheus, by far the inferior man. And he enjoined hard adventures on Hercules, even sending him to Hades to fetch up the dog Cerberus. Thus Hercules was doomed to a life of trouble, and became the type amongst the Greeks not only of manly strength, but of manly endurance. Besides the labours imposed on him by Eurystheus, Hercules undertook adventures on his own account, killing a sea-monster that ravaged Troy, and destroying Troy when the mares promised him as reward for killing the monster were denied him. His love of horses also led him to kill Iphitus, though his guest. Finally, after death, he himself joined the banquet of the deathless gods, with Hebe as his wife; but his phantom, armed with bow and arrow and gold baldric, with wild boars and lions wrought upon it, terrified the dead in Hades. Thus far according to Homer.

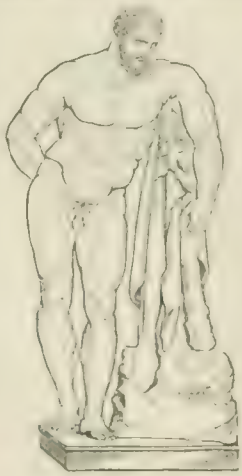
Hesiod adds four more labours, imposed by Eurystheus—the destruction of the Nemean lion, of the Lernæan hydra, fetching the oxen of the triple-bodied Geryones, and the golden apples of the Hesperides; and Hesiod includes amongst the *parerga*, or voluntary exploits, freeing Prometheus from the eagle which tortured him. From later authors we hear of yet more labours, the number of which was first fixed at twelve by Pisander (who lived about 650 B.C., and wrote an epic poem on the adventures of Hercules), though this number was not regarded as a canon either of poetry or art. They are the destruction of the Erymanthian boar, and of the Stymphalian birds; the capture of the Cretan bull, of the stag of Cerynneia, and of the horses of Diomedes; the cleansing of the stables of Augeas; and obtaining the girdle of the queen of the Amazons. Many voluntary exploits are added by later writers to the *parerga* mentioned by Homer and Hesiod, and are as a rule brought into connection with the Homeric story of Hercules, the outlines of which they fill up. Thus, Homer mentions Megara as the wife of Hercules; later writers recount that she was the daughter of the king of Thebes, and that her hand was bestowed on the hero in reward for having freed the Thebans from their tribute to the Minyæ. The story of Hercules' service as a slave to the Lydian Omphale is connected with the Homeric story as being the atonement for the murder of Iphitus. When all other resources fail, topography is made to afford the connection. Thus, the fight with the Centaurs is connected with the labour of destroying the Erymanthian boar, because the scene of the one adventure is in the neighbourhood of the other. It is on his way to Thrace in quest of the horses of Diomedes that Hercules rescues Alcestis, who had given her life for that of her husband Admetus, the guest-friend of Hercules. It is on his way back from the west, when he is returning with the cattle of Geryones by way of Italy to Greece, that he destroys the monster Cacus, who stole his oxen. It is on his way to Gadira in search of Geryones' oxen that he travels in the mystic beaker given to him by the sun-god. And finally, it is *en passant* that he founds the Olympian games also. But in all cases we find that Hercules has become the national hero of the Greeks, and that he is regarded not only as the type of manly endurance, but also as the self-sacrificing hero who succours the oppressed and rids earth of its monsters. As to the manner of his death nothing is said by Homer, but in later times the story was, that, in the agonies caused by the poisoned robe of Nessus sent to him in all innocence as a love-charm by his wife, Deianira, he threw himself on to a funeral pyre on Mount Œta, and was thence carried up to heaven.

It is maintained by some scholars that the origin of Hercules as a mythical figure is not Greek, not even Indo-European, but oriental. And in support of this view there are traits to be found both in literature and art which are undoubtedly oriental. Thus in literature the mystic beaker in which Hercules travels to Gadira is undoubtedly the symbol of the oriental sun-god. The number (twelve) of Hercules' labours is that of the signs of the zodiac. In art the lion-skin which is the characteristic garb of Hercules is undoubtedly a loan from the East; and the resemblances between ancient types of Hercules and the idols of the Phœnician god Besa are undeniable. And even the Greeks themselves identified Hercules with Melcarth of Tyre. In his physical strength Hercules brings to mind Samson, and Samson, on the other hand, has been explained by a venturesome mythologist (Goldziher) as being, like Hercules, a solar hero. But on examination the hypothesis of the oriental origin of the figure of Hercules breaks down. It is quite true that there are amongst the many and diverse elements in the myth of Hercules some of undoubtedly oriental origin; but none of these can be traced back further than the time of Pisander. The story of Hercules as told in Homer is purely Greek. Thus the number (twelve) of Hercules' labours, which forms such an admirable basis for the theory that Hercules is a solar hero and of oriental origin, cannot be traced back further than the time of Pisander, by whom it may well have been borrowed from some eastern story, for he lived in Rhodes, which was exposed to oriental influences. The beaker of the sun-god, again, is borrowed from the East, but is no part of the equipment of the original Homeric Hercules. The lion-skin, which subsequently became the characteristic garb of Hercules, was imported from the Orient. This is indicated by the fact that Pisander first introduced it into literature, and is confirmed by the circumstance that it appears in art for the first time in images from Cyprus, which were plainly produced (as might be expected in Cyprus) under oriental influences. But the lion-skin is not found in literature older than Pisander, and it is uniformly absent from older works of art. Finally, the resemblances between the ancient types of Hercules and the idols of the Phœnician Besa are in part due to the fact that the latter date from the time when Phœnician art was already under the influence of Greek.

That the Greeks themselves identified Hercules with some strange god, whether of Egypt or of

Tyre, is natural enough, but proves nothing. They, like the Romans, were ever on the alert to identify the gods they knew of old with the new deities of foreign nations. Indeed, it is in this tendency that we have to look for the explanation of the growth of the story of Hercules. It is because the Greeks recognised, or thought they recognised, their national hero in the oriental sun-god, that traits and stories belonging to the latter became attached to the former. In this way the hero of the Lydian story was identified with Hercules, and the story of his service to Omphale transferred to Hercules. On the same principle we may probably detach the Italian story of the monster Cacus as an accretion. The Italians recognised in Hercules their own native Genius Jovis, of whom the Cacus story was originally told. Not only was the story absorbed into the Hercules-cycle of myths, but Hercules eclipsed the Genius Jovis in Italy itself. It has, indeed, been supposed that the story of Hercules was known to the Græco-Italians, the common ancestors of Greeks and Italians; but, apart from the doubt which now attaches to the very existence of Græco-Italians, the Latin name Hercules is undoubtedly like that which it stands for borrowed from the Greek. Hercules, as a matter of philology, is a loan-word from the Greek Heracles.

Not only, however, is it possible to strip the original Homeric story of Italian and oriental accretions; it is also possible to trace its growth within the limits of Hellas itself. For as the Greeks identified their national hero with foreign deities and heroes, so Hercules came to be the national Greek hero, because the various Greek states identified him with various local heroes. Thus the Ætolian myth of Deianira and the robe of Nessus came to be attached in the time after Homer to Hercules. And even in the Hercules of Homer and Hesiod we can detect at least two local heroes. The son of Alcmene of Thebes was probably not originally the same hero as the Hercules whose exploits in destroying the Lernæan hydra, Nemean lion, and the Erymanthian boar are localised in the Peloponnese. And this view is confirmed by the fact that, whereas the Peloponnesian hero is named Heracles, the Theban hero was known as Alcæus ('the strong man'), or Alcides ('son of strength'), and compilers of myths had to allege that the change of name from Alcides, the less known name, to Hercules, the better known, was ordained by the Delphian oracle.



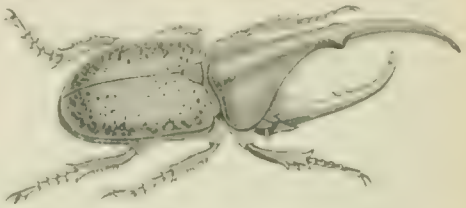
Farnese Hercules.

Further back than this it seems impossible to trace Hercules. There is no reason to imagine that Hercules was known to the Indo-Europeans before their dispersion; and even if some of his adventures (e.g. the oldest labour—that of fetching up Cerberus from the nether world) are really solar in character, we need not close our eyes to the fact that the strong man is a natural subject for myths.

In art, Hercules is represented as the type of manly strength, with muscular limbs, curly hair, and somewhat small head; a club and lion's skin are often added. The most notable statue is the so-called Farnese Hercules, found in the baths of Caracalla in 1599, and now in the museum at Naples. It is the work of the Athenian Glycon, but probably a copy of a work by Lysippus.

Hercules, Pillars of, the name given by the ancients to two rocks flanking the entrance to the Mediterranean at the Strait of Gibraltar. According to one version of the legend, they had once been united, but Hercules tore them asunder to admit the ocean into the Mediterranean; another version represents him as causing them to unite temporarily in order to form a bridge. They seem to have been first visited by the Phœnicians about 1100 B.C. Calpe, one of them, is now identified with Gibraltar, and Abyla, the other, with Ceuta.

Hercules Beetle (*Dynastes hercules*), a gigantic lamellicorn beetle from tropical America, sometimes 6 inches in length. The male bears on the thorax an enormous horn, which is met by a shorter upturned horn from the head, the whole resembling a pair of large but somewhat unequal pincers, of which the body of the insect is the



Hercules Beetle (*Dynastes hercules*).

handle. The female is without horns, and decidedly smaller. Another species, *D. tityus*, about 2 inches in length, occurs in the United States. The genus Megasoma is nearly allied to Dynastes. See also Goliath Beetle.

Hercules' Club is the trivial name of a West Indian tree (*Xanthoxylum caribæum Hercules*), for a kind of gourd, and for a species of Aralia.

Hercynian Forest (Lat. *Hercynia silva*), the general designation of the entire wooded mountain-ranges of middle Germany, from the Rhine to the Carpathian Mountains. Different ancient writers apply the name sometimes to one of the constituent ranges, sometimes to another. Modern geographers, and more particularly geologists, apply the term Hercynian system to all the mountain-chains between Westphalia and Moravia. These have for the most part a north-west to south-east strike, and are all older than the close of the Cretaceous period.

Herder, Johann Gottfried, one of the most thoughtful and suggestive of German writers, called by De Quincey the Coleridge of Germany, equally important as a philosopher, a theologian, and a literary critic, was born at Mohrungen, in East Prussia, on 25th August 1744. He studied at Königsberg, and there became acquainted with Kant and Hamann, the 'Magus of the North.' The latter inspired young Herder with love for the poetry of primitive peoples and the study of the obscure beginnings of civilisation, and for the literature and lore of the Orient, especially of the Bible. But perhaps the greatest thing that Hamann did for Herder was to awaken him to intellectual freedom, to emancipate his mind from traditional habits of thinking and stimulate him to prosecute lines of independent search. In 1764 Herder became assistant-teacher in a school, and assistant-pastor in certain churches, in Riga. Being convinced that literature was to be his life's calling, he began to practise it by writing *Fragmente über die neuere deutsche Literatur*

(1766-67), *Die kritischen Wälder* (1769), and minor pieces, in which he maintained that the truest poetry is the poetry of the people, the spontaneous, unartificial expression of the characteristic human nature that is in them; and, in the spirit of Winckelmann and Lessing, he took up a brief for the idiosyncratic development of national genius in opposition to the fashionable pseudo-classicism of the day. He was an impressive preacher, the subject of his sermons, as of all his writings, being man *qua* man in all phases of his essential and complex nature. Leaving Riga in 1769, he spent some months in travel. It was during this tour that he made the acquaintance of young Goethe at Strasburg; from Herder the future literary imperator of Germany learned to understand the realities of life. In 1770 Herder accepted the appointment of court-preacher at Bückeburg; but six years later he exchanged this uncongenial post for that of first preacher in the town church of Weimar, a position which, partly owing to untoward circumstances, partly—and perhaps principally—to his own innate irritability of temper, proved to be little less uncongenial, in spite of his intercourse with Goethe and the other literary celebrities then gathered in Weimar. It was there that Herder died on 18th December 1803.

Herder's love for the songs of the people, for human nature unadulterated, for simple truth warm with the blood of life's reality, in preference to classic grace and coldness, and the beautiful but artificial poetry of cultured minds, found expression in an admirable collection of folk-songs, *Stimmen der Völker in Liedern* (1778-79), in his favourite book, *Vom Geiste der Hebräischen Poesie* (1782-83; Eng. trans. by James Marsh, 1833), *Ueber die Wirkung der Dichtkunst auf die Sitten der Völker* (1778), in a series of oriental mythological tales, in parables and legends, in his version of the *Cid* (1805), and other works. The principal constructive idea of his thinking was, however, what we should now call the sense of the supreme importance of the historical method. The stimulus of this thought is discernible not only in the works quoted above, but in such books as *Ueber den Ursprung der Sprache* (1772), *Die älteste Urkunde des Menschengeschlechts* (1774-76), and especially in his greatest masterpiece, *Ideen zur Geschichte der Menschheit* (1784-91; Eng. trans. by T. Churchill, 1800), which, like so many of his other books, was left uncompleted. This work is not only the ripest product of his thinking; it is, as it were, the capital of his intellectual kingdom, in which are gathered all the wealth and beauty and power of his mind. Besides its great intrinsic value, the book is remarkable for its anticipations and adumbrations of evolutionary theories. Herder shows that higher and higher types of organisation are observable in all things, stones, plants, and animals, until the culminating type is reached in man; and, as the scale is ascended, a closer and closer resemblance to the culminating type is revealed both in organisation and in the development of powers and instincts. Moreover, the more complex the organisation of a being the greater the extent to which that organisation partakes of the forms existent in the lower grades. But he does not vitalise the scheme of the universe by the conception of genetic development, or the doctrine of organic descent. He does, however, recognise, in a more or less imperfect way, the struggle for existence and adaptation to environment. The end for which all things exist that do exist is, he teaches, man, the crowning work of the universe. But man is not merely the crowning work of the universe; he is also, by analogy of reasoning from the laws of nature, the first and rudest link in a still higher series of existences, and what he has in common with them is his pure humanity, his intelligent, sensitive, and spiritual powers. Hence the life-business of man, the loftiest aim of philosophy and religion, is to cultivate these. Herder is one of the few authors who appreciate the poetry in philosophy and the higher synthesis of both with religion; yet he can scarcely be called a great writer. His last years were chiefly occupied, apart from the *Ideen*, with the *Humanitätsbriefe* (1793-97) and an ill-advised polemic against Kant.

His *Sämmtliche Werke* (60 vols.) were published in 1827-30; later issues are Suphan's (32 vols. 1877-87) and his edition (with Redlich) of the 'selected works' (9 vols. 1884 sq.). See *Erinnerungen*, by Herder's widow (1830); the *Lebensbild*, by his son Emil (1846-47); and collections of his *Letters*. The standard *Life* is Haym's (2 vols. 1880-85); but see shorter lives by Kuhnemann (Munich, 1894), Jorel (Paris, 1875), and Nevinson (London, 1884).

Herd, DAVID (1732-1810), born a Kincardineshire farmer's son, spent his life as an Edinburgh clerk and in literary work, being remembered for his collection of *Ancient Scottish Songs, Heroic Ballads,* &c. (2 vols. 1776; reprinted 1869).

Hérédia, JOSE MARIA DE, French poet, born in Cuba of a wealthy house 22d November 1842, came in boyhood to France, where he was educated, and where with short intervals he subsequently lived. He printed occasional poems, sonnets, &c. for private circulation, and though a Spaniard born, he gradually came to be reckoned one of the most gifted and accomplished of French poets. A collection, *Les Trophées*, published in 1894, deal largely with the Conquistadores. He was admitted to the Academie in 1895.

Heredity, the organic relation between generations—especially between parents and offspring. All offspring produced by sexual reproduction, from a male and a female organism, owe half of their essential (nuclear) material to each parent. Therefore through successive generations there persists a constancy of likeness or stability of type, as expressed in the familiar saying that 'like begets like.' Besides this general resemblance between offspring and parent, there is frequently a reappearance of minute features, idiosyncrasies, and peculiar traits; yet this is not inconsistent with the occurrence of variations, which are in part due to the twofold origin of the offspring, and force us to modify the familiar saying into 'like *tends* to beget like.' In many cases, moreover, the offspring exhibits not only parental, but grand-parental or ancestral characteristics, which when very pronounced or remote are called 'Atavisms' (q.v.) or 'reversions.' Nor is the inheritance confined to normal characters, for diseased, pathological, or abnormal conditions of parents or grand-parents often *reappear* in the offspring, though this reappearance is not always due to transmission. Characteristics acquired by the parents, not as outcrops of their innate constitution, but as the results of use and disuse, or as dints from the environment, often *reappear*, though there is lack of evidence that they are transmitted. Finally, throughout successive generations, there is a tendency to sustain the specific average, by the continued approximation of exceptional forms towards the mean of the species.

Denials.—While a few have been so misguided by prejudice as to maintain that there was no transmission at all, and while a few have exaggerated beyond all credence the undeniable tendency of similar work and surroundings to make offspring like their parents, there is no scepticism of any importance except that which denies the trans-

mission of individually acquired characters. Be it clearly understood that 'natural inheritance' is a certain fact: innate, constitutional, congenital, or germinal qualities, and the results of these in the parents, are certainly transmissible to the offspring: the disputed problem, which awaits experimental evidence, is to what degree, if any, extrinsic, functional, or environmental modifications acquired by the parents can be handed on as a legacy for good or ill to the offspring. That such acquisitions often recur is indubitable, but it is not at present certain that they recur because they have been transmitted. They may of course be the result of the action on the offspring of the same conditions as first evoked them in the parents.

Problems.—In regard to the relation between parents and offspring, there are three great problems to be discussed. What is the peculiarity of the germ-cells which enables them (in most cases after uniting as male and female elements) to develop into organisms essentially like the parents? Granting that the germ-cells are in some respects unique when compared with the ordinary cells of the 'body,' granting that the fertilised egg is in some sense a potential organism, how are we to think of the mechanism of development by which the specific type is reconstructed? Thirdly, what is the probable truth, or present state of opinion, in regard to the transmission of acquired as opposed to constitutional or germinal characters? In addition to these three great problems of individual inheritance, there are minor questions in regard to atavism, reparation of injuries, and the like, detailed practical inquiries as to the inheritance of disease, and, widest of all, those problems of social inheritance which concern the relation between large fraternities of the human species through successive generations.

Mystical Theories. Theories of heredity, like those of many other facts, have been expressed in three sets of terms—theological, metaphysical, and more or less scientific. The ancient hypotheses, that germs were possessed and controlled by spirits, gave place to theories which invoked 'principles of heredity' and 'formative forces,' and these in turn have been displaced by more concrete conclusions. Of most historical importance are the so-called 'mystical' or 'preformation theories,' according to which the male or female germ contained a miniature model of the future organism, and indeed of succeeding generations as well, while the development was merely a gradual unfolding or literal 'evolution.' We still believe of course that the fertilised egg is a potential organism, and that it has great complexity within its apparent simplicity, but the researches of the founders of embryology were enough to show that no miniature models existed, and that development was anything but the unfolding of a bud. See EMBRYOLOGY.

Pangenesis.—Many naturalists have attempted to explain the uniqueness of the germs or germ-cells by regarding them as concentrations of units collected from the various structures of the body. The hypothetical process by which these units are given off from the various organs, travel to the seat of the germs, and are there accumulated to reproduce in the embryo structures like those whence they originated, is termed pangenesis. At such different epochs as are suggested by the names of Democritus and Hippocrates, Paracelsus and Buffon, pangenetic theories were advanced. The first clear theory, however, was that of Spencer (1864), who suggested the existence of 'physiological units,' derived from and capable of development into cells, and supposed their accumulation in the reproductive elements. But the best-known form of the theory is Darwin's 'provisional hypothesis of pangenesis' (1868), according to which (*a*) every cell of the body, not too highly differentiated, throws off characteristic gemmules, which (*b*) multiply by fission, retaining their peculiarities, and (*c*) become specially concentrated in the reproductive elements, where (*d*) in development they grow into cells like those from which they were originally given off. Somewhat later (1876) the ingenious Jäger sought to replace Darwin's gemmules by characteristic 'scent-stuffs,' which were collected from the body into the reproductive elements; he suggested, in other words, what may be called chemical pangenesis. Meanwhile (1872) Galton had been led by his experiments on the transfusion of blood and by other considerations to the conclusion that 'the doctrine of pangenesis, pure and simple, is incorrect.' While reaching forward to something better, he still allowed a limited pangenesis to account for those cases which suggest at least that acquired characters are 'faintly heritable.' He admitted that a cell 'may throw off a few germs [i.e. gemmules] that find their way into the circulation, and have thereby a chance of occasionally finding their way to the sexual elements, and of becoming naturalised among them.' In 1883 Professor W. K. Brooks proposed an important modification of Darwin's theory, especially insisting on the following three points: that it is in unwonted and abnormal conditions that the cells of the body throw off gemmules; that the *male* elements are the special centres of their accumulation; and that the *female* cells keep up the general resemblance between offspring and parent. For criticism of the numerous suppositions involved in the various theories of pangenesis, the reader is referred to the works of Galton, Ribot, Brooks, Herdman, Plarre, De Vries, and others (see bibliography); it is enough for our purpose to notice, in the light of the next step of progress, the comparative gratuitousness of any such special theories.

Fact of Continuity. As far back as 1849 Owen pointed out that in the developing germ it was possible to distinguish between those cells which became much changed to form the 'body,' and those which remained virtually unchanged and formed the reproductive organs. The same distinction was emphasised by Haeckel and by Rauber, while Jäger expressed his views very explicitly as follows: 'Through a great series of generations the germinal protoplasm retains its specific properties, dividing in development into a portion out of which the individual is built up, and a portion which is reserved to form the reproductive material of the mature offspring.' This reservation, by which the germinal protoplasm is sheltered from external or corporeal influences, and retains its specific and embryonic characters unchanged from the parent ovum, Jäger called by a now famous phrase 'the continuity of the germ-protoplasm.' Brooks (1876, 1877, 1883) was not less clear: 'The ovum gives rise to the divergent cells of the organism, but also to cells like itself. The ovarian ova of the offspring are these latter cells, or their direct unmodified descendants. The ovarian ova of the offspring thus share by direct inheritance all the properties of the fertilised ova.' In the same way Galton (1872, 1875), using the term 'stirp' to express the sum total of germs, gemmules, or organic units of some kind in the fertilised ovum, maintained that a certain residue is kept apart from the development of the body, to form the reproductive elements of the offspring. The history must also include Nussbaum, who likewise called attention to the very early differentiation and isolation of the sex-elements to be observed in the development of some animals. The general notion independently suggested by the above naturalists is simple enough. At an early stage in the development of the embryo the future reproductive cells of the organism are distinguishable

from those which are forming the 'body.' The latter develop in manifold variety, and soon lose almost all likeness to the fertilised ovum. The former—the reproductive rudiments—are not implicated in the up-building of the 'body,' remain virtually unchanged, and continue the protoplasmic tradition unaltered so as to start a new organism on the same lines—i.e. with the same protoplasmic material. It is evident that a fertilised egg-cell with certain characters, *a*, *b*, *c*, will develop into an organism in which these characters *a*, *b*, *c* are variously expressed; but if at an early stage

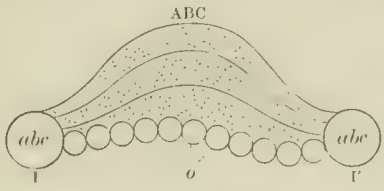


Fig. 1.

I, original ovum; ABC, body of organism to which it gives rise; *o*, chain of ovarian ova with properties *a*, *b*, *c* retained; I', liberated ovum of next generation, virtually equivalent to I.

certain cells are set apart, retaining the characters *a*, *b*, *c* in all their entirety, then these will be on the same footing as the original fertilised egg-cell, able like it to give rise to an organism, and necessarily to a similar organism. This explanation of heredity is at once so simple and so satisfactory that it becomes a most important question to determine how far the above facts are actually true among plants and animals. The answer is that they are as yet demonstrable only in a minority of cases. Thus, it is true that an early appearance or insulation of reproductive cells, materially continuous and presumably identical with the ovum itself, has been observed in some worm-types (leeches, Sagitta, thread-worms, Polyzoa), in some Arthropods (e.g. Moina among Crustaceans, Chironomus among Insects, Phalangidæ among Arachnids), and with less distinctness in a number of other organisms. But it must be distinctly allowed that in *most* cases it is only after development has progressed for some time that the future reproductive cells make their distinct appearance. Therefore, if distinct cellular continuity be only demonstrable in a minority, it becomes necessary to modify the generalisation. The required modification is due to Weismann, whose theory must be briefly stated. (1) A small portion of the effective substance of the fertilised egg-cell remains unchanged during the development, and serves as a foundation from which the germ-cells of the new organism are produced. (2) This important substance—the 'germ-plasma'—which keeps up continuity from one generation to another, is part of the nucleus, possesses an exceedingly complex minute structure, but has great stability, for it absorbs nourishment and grows enormously without the least change in its molecular constitution. (3) But while part of this special nuclear substance or germ-plasma of the egg-cell is reserved unchanged for the formation of the germ-cells of the resulting organism, part of it is changed into the nuclei of the ordinary body-cells, where, however, it sometimes retains enough of its original efficiency to be able to repair serious injuries or start the development of a new organism in *asexual* reproduction. Weismann has given a more complete expression to the fact of the continuity of generations than has hitherto been proposed, but it cannot be denied that there is much that is entirely hypothetical about the 'germ-plasma' and its history. For thorough exposition, reference must be made to his translated papers, and for detailed criticism to works cited in the bibliography.

We may further notice an important work by H. de Vries (1889), which seeks to combine the fact of continuity with part of the theory of pangenesis. He maintains that every characteristic of the organism is represented by a special 'pangene,' and that the germ-cells contain samples of all. This pangenetic accumulation in the germ-cells is not, however, the result of contributions travelling from the various parts of the body, but is the result of a definite, more or less direct continuity between the germ-cells and the fertilised ovum which started the organism to which they belong.

Theories of Continuity.—It can hardly be doubted that in the more or less direct continuity between the successive sets of reproductive products lies the solution of the main problem of heredity. The germ-cells which give rise to offspring are unique in their continuity with those which gave rise to the parents and it is this continuity or the involved sameness of material which explains the production of like by like. In the simplest animals or Protozoa, organism A buds and hands on a fraction of its living matter to A1, which, being so really part and parcel of A, must grow up into a similar adult Protozoon. With higher animals the same holds true, though the continuity, as expressed in

Fig. 2.—The Relation between Reproductive Cells and the Body:

The continuous chain of dotted cells at first represents a succession of Protozoa; further on, it represents the ova from which the 'bodies' (undotted) are produced. At each generation a spermatozoon fertilising the liberated ovum is also indicated.

the figure, is less direct. At various levels of analysis suggestions have been made which attempt to render the fact of continuity more luminous. Thus, Professor Hering and Samuel Butler suggested about the same time a psychical aspect of hereditary continuity, according to which memory is regarded as a general function of organised matter, and the reproduction of parental likeness as due to an unconscious recollection of the past. Haeckel also emphasised the luminous metaphor of 'organic memory,' but sought to express this in terms of molecular motion. The invisible activity of the organic molecules he compares to a complex wave-motion, harmonious and persistent from generation to generation, though capable of incorporating the results of fresh experience. The periodic wave-motion of the molecules he describes characteristically as 'the perigenesis of the plastidules.' In metaphorical language, the molecules remember or persist in the rhythmic dance which they have learned. Most naturalists, however, have been content to express the continuity in terms of the cells or of the nuclei, or of yet smaller elements. Galton and Jäger, Brooks and Nussbaum, Hertwig and Herdman, Nägeli and Weismann, and others have all contributed to making the fact of continuity more precise. Hopeful also are the suggestions of Jäger, Berthold, Gautier, and Geddes, which make towards a *chemical* expression of the continuity between germ and germ. Within present limits it is impossible to criticise any of the above elaborations. Behind all the suggestions, whether of 'organic memory,' 'persistent wave-motion,' 'stable germ-plasma,' or 'constancy of chemical processes,'

there stands the great fact of the real continuity of generations.

The Problem of Reconstruction.—How is it that the germ-cell divides and redivides as it does, and how does the development of the embryo retain its architectural constancy? Part of the answer has just been given—because the germ is virtually continuous with, and made of the same stuff as, the parent germ; therefore it must behave in precisely similar fashion. The rest of the answer involves difficulties which cannot fairly be laid on the shoulders of students of heredity, but belong to that most intricate of problems, the mechanics of development. Referring to the article EMBRYOLOGY for notice of some of the pioneer investigators of this problem, we can do little more than reiterate the caution of Professor His: 'To think that "heredity" will build up organic beings without mechanical means is a piece of unscientific mysticism.' We must also protest against the careless diction which makes 'heredity' now into a 'principle' and again into a 'power,' which calls it sometimes a 'law' and next time a 'cause.'

Inheritance of Acquired Characters.—Changes or variations in an organism may be roughly referred to three origins: (*a*) they may be the results of external or environmental influence; (*b*) they may be the outcome of use and disuse, or of functional increase or decrease; or (*c*) they may be due to internal, constitutional, or germinal conditions, of which one of the most important is the mingling of two different kinds of living matter in the fertilisation of the egg-cell. It is granted by all that an individual plant or animal may exhibit these three kinds of variation—environmental, functional, and organismal; and it is also true that the majority of naturalists have till recently believed that an individual gain or loss from any of the above origins might be transmitted from parent to offspring. Now, however, there is a widespread scepticism as to the inheritance or transmission of any but organismal, congenital, or germinal variations. This scepticism, mainly emphasised by Weismann, and now prevalent among naturalists, is by no means novel. The editor, whoever he was, of Aristotle's *Historia Animalium* seems to have differed from his master as to the inheritance of injuries and the like. Kant also maintained the non-inheritance of extrinsic variations, and Blumenbach cautiously inclines to the same negative position. In more recent times, His expressed a strong conviction against the inheritance of acquired characters, and Pflüger is also among the sceptics. A few sentences from Galton (1875), whose far-sightedness has been insufficiently acknowledged, may be quoted. The inheritance of characters acquired during the lifetime of the parents 'includes much questionable evidence, usually difficult of verification. We might almost reserve our belief that the structural cells can react on the sexual elements at all, and we may be confident that at the most they do so in a very faint degree—in other words, that acquired modifications are barely, if at all, *inherited* in the correct sense of that word.' Weismann, however, has brought the discussion to a climax. He goes even further than Galton in scepticism as to the inheritance of acquired characters, for he denies that any such transmission occurs. This denial is in part justified by the absence of experimental evidence to the contrary, but it is also suggested by Weismann's theory of continuity. For if a portion of the germ-plasma of a fertilised ovum is preserved unchanged during development to form the rudiments of the reproductive cells of the new organism, and if the germ-plasma is as stable as Weismann makes out, then there is a strong probability that no variations produced in the body by use or disuse or by outside influences can be transmitted. For they could only be transmitted by affecting the germ-cells, and this is a possibility which Weismann denies. He makes, however, two admissions: (*a*) that the germ-plasma may be slightly modified by changes of nutrition and growth in the body, and (*b*) that external conditions such as climate may influence the germ-cells *along with*, though not exactly *through*, the body-cells. These admissions are of course different from the once prevalent opinion that changes in the body were able to affect the germ-cells, and thus become transmissible, though it may be questioned whether the two saving clauses which Weismann allows are not sufficient to damage seriously the stringency of the conclusion on which he insists throughout—that no acquired characters are transmissible.

If this conclusion be true, then the influences of function and environment on the body of an organism *affect the individual only*, not the species. They have therefore no evolutionary value; the source of variation and the origin of adaptations must be sought elsewhere. To Weismann the sole source of evolutionary change is the intermingling of germ-plasma which occurs in fertilisation, and the condition of progress is found in the action of natural selection on the germinal variations which thus arise. There are, however, evolutionists who regard species as the necessary results of persistent variation in some definite direction, 'according to the laws of organic growth,' 'according to the conditions of protoplasmic change,' 'according to the opposition between nutrition and reproduction,' and so on. Those who take this view, even if they admit Weismann's conclusion about acquired characters, will not find it necessary to lay the entire burden of progress on the shoulders of natural selection.

As Weismann's conclusion that acquired characters are not transmitted is one of vast importance both theoretically and practically, it is necessary to notice some of the counter arguments. (*a*) There are very numerous cases on record where the effects of mutilation are said to be inherited, but it must frankly be allowed that no case is known which is not open to serious objection. Circumcision has a very ancient origin, but its effects on the Jewish race are imperceptible; while the same is true of mutilations inflicted for many generations on domesticated animals. And even the numerous cases of tailless kittens produced from artificially curtailed cats have little cogency in face of the fact that tailless sports may also arise from normal parents. (*b*) Various pathologists have brought forward instances of what appeared to them to be the transmission of acquired disease, but their arguments, as in the case of Virchow's, have evidenced misunderstanding as to Weismann's real position. There is no doubt that many malformations and weaknesses appear through numerous generations, but there is no evidence that such variations were not to start with germinal. If so, Weismann of course admits their transmissibility. Colour-blindness has been known to occur in the males only of six successive generations, deaf-mutism for three, finger-malformations for six, and so with harelip and cleft-palate, and with tendencies to consumption, cancer, gout, rheumatism, bleeding, &c. But none of these prove the transmission of characters acquired by use or disuse, or impressed by the action of surroundings. (*c*) Various naturalists have brought forward what appear to them to be examples of the genuine transmission of individually acquired characters. Thus, Detmer and Hoffmann among botanists, and Eimer among zoologists, may be quoted. Even the title of Eimer's recent work, *The Origin of Species, on the Basis of the Inheritance of acquired Characters, according to the Laws of Organic Growth*, shows how far he is from giving up the case. It

must be confessed, however, that, in default of fresh experiments, cogent evidence to negative Weismann's scepticism is still awanting, though some suggestive arguments in support of the old-fashioned belief in the inheritance of acquired characters are forthcoming, especially perhaps in connection with instinct and the growth of intelligence. (*d*) Another mode of argument often adopted against Weismann's conclusion is to shift the ground to the study of evolution, and there to demonstrate steps of progress which seem to many inexplicable on Weismann's sole formula of natural selection acting on variations produced by the intermingling of male and female germ-plasmas in fertilisation. (*e*) Finally, it may be urged that the unity of the organism, the connectedness of its elements, the common medium of the blood, and other facts make it difficult to believe that the germ-plasma can live on in the reproductive organs, unchanged by any of the deep environmental and functional variations which sometimes modify the structure of the body. Those who seek to maintain the transmission of some acquired characters have obviously to submit their cases to all the stern criticism which Weismann's valuable work involves. But if such cases be proved, it need not, of course, lead to any departure from some form of the doctrine of continuity, on which Weismann has so well insisted, nor to a return to the supposition of travelling 'pangenes.' It does not affect the theory of continuity to admit that decisive variations produced by environment or function may send their roots deep into the system, penetrating through the body to the reproductive cells themselves. Such cases are confessedly at present dubious, but there is no *a priori* reason why the sex-cells should not share in the results of altered nutriment and waste products, and even become saturated or infected by the characteristic chemical results of environmental and functional variations.

Social Aspects.—All the important biological conclusions, such as that of germinal continuity, or the fact that the two parents contribute almost equal shares to the starting of the offspring, and also the scepticism about the transmission of acquired characters, have an obvious human interest. The first result enables us to realise that the germ is virtually as old as the parent, and that

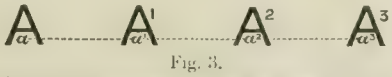


Fig. 3.

A A¹, the bodies of successive generations; *a*–*a*³, the germ-cells between which the real continuity obtains.

the main line of hereditary connection is not that between parent and child, but 'that between the sets of elements out of which the personal parents had been evolved, and the set out of which the personal child was evolved.' 'The main line,' Galton says, 'may be rudely likened to the chain of a necklace, and the personalities to pendants attached to the links.' To this fact social inertia is largely due, for the organic stability secured by germinal continuity hinders evolution by leaps and bounds, either forwards or backwards. That a good stock is pre-eminently valuable is an obvious truth. The fact that each parent contributes almost equally to the offspring emphasises the two-sided responsibility of parentage; but the fact has to be corrected by Galton's statistical conclusion that the offspring inherits a fourth from each parent, and a sixteenth from each grand-parent. Inherited capital is thus not merely dual, but multiple, like a mosaic. Again, if we believe with Weismann that no acquired characters are inherited, we are saved from the despair which the abnormal functions and environments of our civilisation are apt to suggest. But if the influences of function and environment do not readily become entailed or ingrained, we are all the more urged to practical action, which will secure improved conditions of life for each successive crop of individuals.

The fact that pathological conditions innate or congenital in an organism certainly tend to be transmitted suggests that popular opinion should be informed and educated as to undesirability of parentage on the part of abnormal members of the community. All congenital *malformations* and defects due to germinal faults tend to be transmitted, and the list includes not a few of evident practical importance, such as poverty of teeth, abnormal fingers, harelip and cleft-palate, and defective sense-organs. Still more important, however, are congenital or constitutional, as opposed to acquired, *diseases*. Certain forms of insanity and diseases of the nervous system and sense-organs, deaf-mutism, colour-blindness, gout, muscular weakness, unusual liability to certain contagious diseases, tendencies to consumption, cancer, and dipsomania, are illustrations from a long list of inheritable diseases or weaknesses. Some diseases are transmissible with greater probability than others—i.e. in a larger percentage of cases; some appear to take a firmer grip of the constitution, and may persist for many generations, while others are more readily counteracted or 'washed out' by hygienic régime or by intercrossing; some are transmitted along tolerably constant lines—e.g. father, daughter, grandson—i.e. in alternate sexes, or father, son, grandson—i.e. along similar sexes, while others are quite irregular in their occurrence. In reference to lines of transmission, Galton is inclined to conclude that 'the female influence is inferior to that of the male in conveying ability.' In the case of a disease like consumption, which decimates our British population, it ought to be noted that in about 50 per cent. of cases it is individually acquired, not inherited; that, as the disease is bacterial, only a consumptive *tendency* at most is transmitted; that, even when the phthisis 'runs in families,' its propagation is sometimes due to maternal or other infection; that environmental conditions, such as the nature of the soil, seriously affect its frequency; that, with care in regard to climate, surroundings, diet, exercise, &c., even children with a consumptive tendency may rejoin the healthy stock. None the less is it inadvisable that consumptives should be parents, least of all along with other consumptives. Allowing, again, for the undeniable influences of early nutrition, upbringing, and surroundings, all authorities admit that dipsomania or its results tend to be transmitted, often with the final consequence of extinguishing the family. Yet, in regard to the inheritance of pathological conditions, it ought to be noticed (*a*) that Virchow and others have hinted at an 'optimism of pathology,' since some of the less known abnormal variations may be associated with new beginnings not without promise of possible utility; (*b*) that, by the intercrossing of a tainted and a relatively pure stock, a recuperative or counteractive influence may act so as to produce comparatively healthy offspring, thus illustrating what may be called the 'forgiveness of nature.'

Social Inheritance.—The widest problems of heredity are raised when we substitute 'fraternities' for individuals, or make the transition to social inheritance. For lack of reliable statistics, and experts capable of wielding the statistical method, the complex problems of the relation between successive generations of a society have rarely been essayed. The most important pioneering is that of Galton, whose unique papers have been recently summed up in his *Natural Inheritance*

(1889), a work which, in its emphatic transition from the study of individuals to that of fraternities, well illustrates that science is indeed 'a social phenomenon.' Galton derived his data from his well-known *Records of Family Faculties*, especially concerning stature, eye-colour, and artistic powers; and his work has been in great part an application of the statistical law of Frequency of Error to the above-mentioned records. If we leave out of account the problem of estimating the share contributed to the offspring by each ancestor, and that of determining accurately the degrees of near kinship, the great problem of Galton's work relates to the curious regularity observed in the peculiarities of great populations during a long series of generations. 'The large do not always beget the large, nor the small the small; but yet the observed proportion between the large and the small, in each degree of size and in every quality, hardly varies from one generation to another.' In short, a specific average is sustained. This is not because each individual leaves his like behind him, for this is certainly not the case. It is rather due to the fact of a regular regression or deviation which brings the offspring of extraordinary parents in a definite ratio nearer the average of the stock. A few sentences must be quoted to explain this 'law of regression' which Galton has established. 'However paradoxical it may appear at first sight, it is theoretically a necessary fact, and one that is clearly confirmed by observation, that the stature of the adult offspring must on the whole be more mediocre than the stature of their parents—that is to say, more near to the median stature of the general population.' Or again, 'each peculiarity in a man is shared by his kinsmen, but *on the average* in a less degree. It is reduced to a definite fraction of its amount, quite independently of what its amount might be. The fraction differs in different orders of kinship, becoming smaller as they are more remote.' Yet it must not be supposed that the value of a good stock is denied or underestimated by Galton, for he shows how the offspring of two ordinary members of a gifted stock will not regress like the offspring of a couple equal in gifts to the former, but belonging to a poor stock, above the average of which they have risen. Yet it is true that the fact of regression tells against the full hereditary transmission of any signal talent. Children are not likely to differ from mediocrity so widely as their parents. 'The more bountifully a parent is gifted by nature, the more rare will be his good fortune if he begets a son who is as richly endowed as himself, and still more so if he has a son who is endowed more largely.' The other aspect of the case must not, however, be overlooked. 'The law,' Galton says, 'is even-handed; it levies an equal succession-tax on the transmission of badness as of goodness. If it discourages the extravagant hopes of a gifted parent that his children will inherit all his powers, it no less discountenances extravagant fears that they will inherit all his weakness and disease.'

The study of individual inheritance, as in Galton's *Hereditary Genius*, may tend to develop an aristocratic and justifiable pride of race when a gifted lineage is demonstrable for generations, or it may tend to absolute despair if the records of family disease be subjected to investigation. The study of social inheritance is at once more democratic and less pessimistic. The nation is a vast fraternity, with an average towards which the descendants of all nobles gradually tend, but to which the offspring of the under-average will also approximate. It seems a corollary that practical measures which beneficently affect large numbers are more hopeful than those which artificially select a few. It should be noticed also that, if Weismann's scepticism be thoroughly justified, it by no means leads us to depreciate the effect of work and surroundings, but emphatically increases the urgency of conserving healthful function and stimulating environments of every kind—all the more important if their influences must needs be repeated on each fresh generation. Nor should one forget how much a plastic physical and mental education (along with which M. Guyau includes hypnotic suggestion) may do to counteract disadvantageous inherited qualities, or augment those which are beneficial. Finally, it will be allowed that much requires to be done in educating public opinion, not only to recognise the results of the science of heredity, but also to admit the value and necessity of the corresponding art which Mr Galton calls 'eugenics.'

See Biology, Embryology, Environment, Evolution, &c. For bibliography, J. Arthur Thomson, 'History and Theory of Heredity,' *Proc. Roy. Soc. Edin.* (1889); E. Roth, *Die Thatsachen der Vererbung* (2d ed. Berlin, 1885). See also W. K. Brooks, *The Law of Heredity* (Baltimore, 1883); S. Butler, *Life and Habit* (Lond. 1878); C. Darwin, *Variation under Domestication* (Lond. 1868); G. H. T. Eimer, *Die Entstehung der Arten* (Jena, 1888); F. Galton, *Natural Inheritance* (Lond. 1889; and his other works there noticed); E. Haeckel, *Generelle Morphologie* (Berlin, 1866), *Die Perigenesis der Plastidule* (Berlin, 1876); W. A. Herdman, *Philos. Soc. Liverpool* (1883); E. Hering, *Das Gedächtniss als eine allgemeine Funktion der organischen Materie* (Vien. 1870); O. Hertwig, *Lehrbuch der Entwicklungsgeschichte* (Jena, 1888); W. His, *Unsere Körperform* (Lcip. 1875), G. Jaeger, *Zoologische Briefe* (Vien. 1876, Kosmos, 1877, 1879); *Zeitschr. wiss. Zool.* xxvii; *Lehrbuch der Zoologie* (Lcip. 1878); Prosper Lucas, *Traité philosophe. et physiol. de l'Hérédité naturelle* (Paris, 1847; the first serious treatise on heredity); C. Nageli, *Mechanisch-physiolog. Theorie der Abstammungslehre* (Munich, 1884); Th. Ribot, *L'Hérédité psychologique* (3d ed. Paris; trans. Lond. 1875); H. Spencer, *Principles of Biology* (Lond. 1866; R. Virchow, *Descendenz und Pathologie*; Virchow's *Archiv.* ciii. (1886); H. de Vries, *Intrazellulare Pangenesis* (Jena, 1889; A. Weismann, *Papers on Heredity* (1882–1889; trans. Oxf. 1889). For pathological inheritance, see, conveniently, Felkin, 'Heredity in Health and Disease,' *Health Lectures* (Edin. 1887), R. A. Douglas Lithgow (Lond. 1889); Windle, 'Malformations and Heredity,' *Proc. Birmingham Phil. Soc.* (1888). For heredity in relation to education, see M. Guyau, *Education et Hérédité* (Paris, 1889). For social inheritance, see Galton's *Hereditary Genius* and *Natural Inheritance*. For critiques of Weismann, see Eimer, Virchow, *opp. cit.*; Spencer, *Factors of Organic Evolution* (1886); M'Kendrick, *General Physiology* (1888); Vines, Turner, and Mivart in *Nature*, vols. xl. and xli. See also Weismann, *The Germ-plasm, a Theory of Heredity* (1893), and the articles Variation, Weismann.

Hereford, the county town of Herefordshire, on the left bank of the Wye, 144 miles by rail WNW. of London, and 51 S. of Shrewsbury. Its noble cathedral was built between 1079 and 1535, and so exhibits every variety of style from Norman to Perpendicular. Measuring 342 feet by 146 across the transept, it has a central tower 165 feet high. It suffered much at Wyatt's hands after the fall of the western tower in 1786, but has been judiciously restored by Cottingham (1841–52) and Sir G. G. Scott (1856–63). Special features are the elaborate metal-work screen, the shrine of St Thomas de Cantilupe (1282), the organ (originally by Renatus Harris), and the 'Mappa Mundi,' or map of the world (*c.* 1314), a fac-simile of which was published in 1872. Hereford, with Gloucester and Worcester, is one of the meeting-places of the 'Three Choirs.' Other edifices are the Doric shire hall (1817), in front of it a statue (1864) of Sir G. C. Lewis; the corn exchange (1858), the episcopal palace (formed out of a Norman hall), the college of vicars choral (*c.* 1474), the 14th-century grammar-school, the half-timbered 'Old House,' the guildhall, the butchers' guildhall, the Coningsby Hospital (1610),

the free library (1876), &c. The Nelson column (1807) marks the site of the almost obliterated castle: and the White Cross, one mile out on the Hay road, commemorates the Black Death of 1347. Nell Gwynne and Garrick were natives. A large trade is done in agricultural produce; and the rose-gardens of Hereford are famous. The seat of a bishopric from 676, the city was chartered by Henry III., and returned two members to parliament—now only one—from Edward I.'s reign till 1885. It has stood many sieges from Stephen's time down to the Great Rebellion. Pop. (1851) 12,108; (1881) 19,822; (1891) 20,267. See works by Britton (1831) and Havergal (1869).

Herefordshire, an inland county in the west of England, is bounded on the N. by Shropshire, E. by Worcester, S. by Gloucester and Monmouth, and W. by South Wales. In length it measures 38 miles, in breadth 35, and its area is 833 sq. m. Pop. (1801) 89,191; (1871) 125,370; (1881) 121,062; (1891) 115,986. The surface is mostly hilly with occasional valleys opening into widespread plains, the chief hill-ranges being those of the Hatterell or Black Mountains (2631 feet) on the south-western, and the Malvern Hills (1395) on the eastern boundary of the county. It is watered by several streams, the principal of which are the Teme, and the Wye with its affluents the Lugg, the Arrow, and the Monnow, alike noted for their fishing, and the Wye in particular for its picturesque scenery. The climate of Herefordshire varies with the elevation and exposure, but, as attested by the general longevity of the inhabitants, is on the whole very healthy. The soil, which is for the most part a deep, heavy, red loam, with a substratum in many places of limestone, produces good crops of grain, principally wheat, and is favourable to the growth of timber. Hops are largely cultivated, and the area of the orchards with which the county abounds exceeds 27,000 acres. Herefordshire is celebrated for its cattle, and its horses and sheep are in a lesser degree well known. Cider-making is the principal manufacture, and malting is also carried on; whilst sandstone, limestone, and marble have been largely quarried. The county, divided into 11 hundreds and 258 parishes, returns three members to parliament, one for each of its two divisions (Leominster and Ross), and one for the city of Hereford. The county council numbers sixty-eight members. The principal towns are Hereford, Leominster, Ross, and Ledbury.

The historical events connected with the county are soon told. Its earliest inhabitants were the Silures, who for long withstood an invasion of the Romans, but, being at last (about 73 A.D.) overcome, they retired into the fastnesses of Wales. During the so-called Heptarchy it was incorporated with Mercia, and subsequently from its position on the Welsh border was—a portion of the county being included in the debateable land called 'the Marches'—the scene of prolonged contests between the rival claimants. In 793 A.D. Ethelbert, king of the East Angles, was treacherously murdered at Sutton, near Hereford; and in 1461 at Mortimer's Cross, 4 miles north-west of Leominster, the decisive battle took place between the houses of York and Lancaster which resulted in the defeat of the latter and the establishment of Edward IV. on the throne of England. Subsequently Herefordshire suffered much during the civil broils in the time of Charles II. Of places of interest in the county mention may be made of Offa's Dyke (q.v.); of Dorstone, where there is a large and curious cromlech known as 'Arthur's Stone;' of the ruins of Clifford Castle, the birthplace of 'Fair Rosamond,' Henry II.'s mistress; and of the Hereford Beacon on the Malvern Hills, on which is a camp, the construction of which is ascribed to Caractacus. Robert Devereux, Earl of Essex (Queen Elizabeth's favourite); Richard Whittington, 'thrice Lord Mayor of London;' David Garrick, the actor; John Kyrle ('The Man of Ross'); and Nell Gwynne, the favourite of Charles II., were all natives of Herefordshire; and Mrs Browning, the poetess, passed her childhood there. See the *Quarterly Review* for 1879, and works there cited. For the Earls of Hereford, see BOHUN.

Herencia, a town of Spain, 40 miles NE. of Ciudad Real, carries on manufactures of soap. Pop. 6000.

Hereros. See DAMARALAND.

Heresy (Gr. *hairesis*) primitively means a *choice* or *election,* and in its application to religious belief is used to designate as well the act of choosing for one's self, and maintaining opinions contrary to the authorised teaching of the religious community to which one's obedience is due, as also the heterodox opinions thus adopted and the party which may have adopted them. In the Acts of the Apostles (see v. 17, xv. 5, xxiv. 5, xxviii. 22) the word seems to be used of a sect or party, apart from the consideration of its character, whether good or bad; but in the Epistles and in the early Christian writers it is almost invariably used in a bad sense, which is the sense uniformly accepted in all subsequent theological literature. Roman Catholic writers, regarding the authority of their own church as supreme and final, apply the name of heresy to any formal denial of a doctrine proposed by the Roman Catholic Church as necessary to be believed. Protestant writers seldom use the word, except in relation to what each sect regards as the essentials of Christian faith.

Even in the apostolic times heresies had arisen in the church, and before the Council of Nice the catalogue of sects had already swelled to considerable dimensions. The chief early heresies are reducible to two classes: (1) those which attempted to associate the Christian doctrines with Judaism; (2) those which ingrafted Christianity upon the Gentile religions or the Gentile philosophies.

From the very date of the establishment of Christianity in the Roman empire heresy appears to have been regarded as a crime cognisable by the civil law; and Constantine enacted several severe laws for its repression, which were continued and extended by his successors, and were collected into a single title, *De Hæreticis,* in the Justinian code. The penalties of heresy ordained by these enactments are very severe, extending to corporal punishment, and even to death; and they all proceed on the distinct assumption that a crime against religion is a crime against the state. These enactments of the Roman law were embodied in the various codes of the European kingdoms; in English law heresy consisted in holding opinions contrary to Catholic faith and the determination of Holy Church. By common law the offender was to be tried in the provincial synod by the archbishop and his council, and, after conviction, was to be given up to the king to be dealt with at his pleasure. But the statute 2 Hen. IV. chap. 15 (*De hæretico comburendo*) empowered the diocesan to take cognisance of heresy, and, on conviction, to hand over the criminal directly, and without waiting for the king's writ, to the sheriff or other competent officer. This statute continued practically in force, with certain modifications, till the 29 Charles II. chap. 9, since which time heresy is left entirely to the cognisance of the ecclesiastical courts. The article BLASPHEMY deals with an important cognate subject.

In the case of clergy of the Church of England, under a statute of 1571 (now confined to its narrowest effect by a series of judgments) any distinct contradiction of the Articles, or obvious evasion of

them, subjects the offender to deprivation of his benefice. The supreme authority is the Judicial Committee of the Privy council, which construes the articles and formularies according to the legal rules for the interpretation of statutes (see ECCLESIASTICAL COURTS; and ENGLAND, CHURCH OF). In the Presbyterian churches a heretical minister is usually tried by his presbytery, and may be deposed from the ministry by the General Assembly.

For the history and literature of heretical sects, consult the very numerous articles in this work on the various bodies of heretics, as ALBIGENSES, ARIUS, ELIONITES, ESSENES, GNOSTICS, MANICHEANS, MONTANUS, MYSTICS, PELAGIUS, &c. See also the articles BAUR, CHURCH HISTORY, DOMINICANS, EXCOMMUNICATION, INQUISITION, PERSECUTION; the standard ecclesiastical historians; Arnold's *Kirchen- und Ketzer-Historie* (1699); Hahn's *Ketzer im Mittelalter* (1850); and Hilgenfeld's *Ketzergeschichte des Urchristenthums* (1884).

Hereward, commonly called HEREWARD THE WAKE, was an English yeoman or squire who held the Isle of Ely against William the Conqueror in 1070–71. When William had succeeded in encompassing the English patriots and penetrating to their camp of refuge, Hereward, scorning to yield, cut his way through to the fastnesses of the swampy fens northwards. It is probable that he subsequently became reconciled to William. He held property in Warwickshire and probably also in Worcestershire. The noble lineage assigned to Hereward in Charles Kingsley's romance of *Hereward the Wake* (1866) has been shown by Freeman (*Norman Conquest*, vol. iv.) to be destitute of historic foundation.

Herford, a town in the Prussian province of Westphalia, situated close to the frontier of Lippe-Detmold, 59 miles SW. of Hanover by rail. Flax and cotton spinning, linen weaving, and the manufacture of sugar and confections are carried on. Pop. (1875) 12,012; (1885) 15,902; (1895) 21,535.

Hergest, THE RED BOOK OF, the name usually given to a great manuscript, the chief repository of Welsh literature, now preserved in the library of Jesus College, Oxford. It owes its name to Hergest Court, a seat of the Vaughans, for whom most likely it was originally compiled. It is a folio volume of 360 vellum leaves written in double columns, from the beginning of the 14th to the middle of the 15th century. Its eleven prose tales were printed by Lady Charlotte Guest, together with the romance of the *Hanes Taliessin*, under the name of *Mabinogion*, although in the Red Book itself that name is applied to four only.

Heriot, in English law, is a kind of fine due to the lord of a manor on the death of a person holding land of the manor, and consists of the best beast, jewel, or chattel that belonged to the deceased. The lord can enforce this right by action, or seize it *brevi manu*. Heriots probably originated in the return of the horse and arms lent by a feudal lord to his tenant; they are now seldom paid in respect of freehold lands, and they are regarded as one of the most vexatious incidents of copyhold tenure. See COPYHOLD.

Heriot, GEORGE, founder of a magnificent school at Edinburgh, was a descendant of the Heriots of Trabroun, East Lothian, and was born at Edinburgh in June 1563. Commencing business as a goldsmith in that city in 1586, he was, after being eleven years in business, appointed goldsmith to Anne of Denmark, consort of James VI. of Scotland, and soon after to the king. On James's accession, in 1603, to the English throne, Heriot went to London, where, as court-jeweller and banker, he amassed considerable riches. He died at London, February 12, 1624, without issue, and bequeathed the residue of his property, amounting to £23,625, to found and endow a hospital (or school) in Edinburgh for the maintenance and education of the sons of poor deceased or decayed burgesses. Heriot's Hospital was completed from a design, it is believed, by Inigo Jones, in 1659. In 1837 an act of parliament was procured for expending surplus funds which had accumulated in the hands of the trustees in the erection of free schools for poor children (ultimately sixteen in all). The Act of 1885, at which time the annual revenue of the trust amounted to £26,502, reconstituted the hospital as a middle-class and technical school, and closed the free schools in the city. The Heriot-Watt College was also subsidised from the Heriot funds, to provide for older students thorough scientific and technical instruction at moderate fees. Besides, there are valuable bursaries awarded for the promotion of secondary and higher education, tenable at George Heriot's Hospital School, the High School, the Heriot-Watt College, and the university. And a sum is expended in providing free education, books, &c. for poor children attending public or state-aided schools. The revenue is now about £35,000, and it is estimated that it will ultimately increase to little short of £50,000. 'Jingling Geordie' figures in Scott's *Fortunes of Nigel*. See *History of Heriot's Hospital*, by W. Steven (new ed. 1859).

Herisau, the largest town of the Swiss canton of Appenzell, in the Ausser Roden division, stands 2549 feet above sea-level, 5½ miles SW. of St Gall by rail. It is a thriving seat of the cotton manufactures. Pop. 11,082.

Heristal, or HERSTAL, an industrial town of Belgium, on the Meuse, immediately NE. of Liége, of which it is virtually a suburb. It is mostly inhabited by workmen, who find employment in the coal-mines and the iron and steel works. Ruins still exist of the castle of Heristal, the birthplace of Pepin, the mayor of the palace; and his great-grandson Charlemagne frequently resided here. Pop. 11,918.

Heritable and Movable, a Scotch law-phrase denoting the distinction of things which go to the heir and to the executors respectively. Movables include such property as passes to the executor in succession, or is removable by the tenant on leaving his farm, or as comes under the operation of the law of the owner's domicile in bankruptcy and succession. Money and household furniture may be taken as examples. Heritable subjects are such as go to the heir in succession, or go with land to a buyer, and are regulated by the territorial law. The best examples are land and houses. The gearing of engines and all machinery fixed to the floor are also heritable. The distinction corresponds to a certain extent to the phrase 'Heir and Executor' in England.

HERITABLE BOND, in Scotch law, is a personal bond for a sum of money, with a real right of annual rent payable out of land, and accompanied by a conveyance of the lands themselves in security. The usual deed is now a bond and disposition in security, corresponding to the English Mortgage (q.v.).

HERITABLE SECURITIES, the name given in the law of Scotland to what are called mortgages and charges on land in England. These were formerly distinguished into wadset, infeftment of annual rent, heritable bond, bond and disposition in security, and absolute disposition with back-bond, and also reserved burdens on land. By the constitution of a heritable security the debt secured becomes a burden on the land, entitling the creditor to appropriate the rents until the debt is paid. This right of the creditor remains entire against the land, no matter into whose hands it passes,

and without affecting or being affected by the feudal titles, which confer and transmit the radical right to the land. In Scotland the principal heritable security is now called the bond and disposition in security, which consists of an obligation to pay the debt, and a disposition to the creditor, by way of security till the debt is paid. The bond must be registered in the Register of Sasines to complete the creditor's title, and it is assignable to a third party. A power is always given to the creditor to sell the estate if the principal or interest is not paid, in which case the creditor must account for the surplus after paying himself his debt.

Heritable Jurisdictions, a remarkable class of jurisdictions held hereditarily from the crown in Scotland, and abolished in 1748. These jurisdictions amounted to upwards of a hundred in number, and consisted of sheriffships, stewartries, constabularies, but principally of regalities and bailieries, with some offices of distinction. One of the more important was the office of Lord Justice-general and the lordship of Argyll and the Isles, both belonging to the family of Argyll. In virtue of their hereditary rights, the possessors of these jurisdictions exercised an arbitrary power over vassals and others within the limits of their domain, and could punish them by fines, scourging, imprisonment, and even in some cases put them to death, without interference of the common law. As repugnant to social policy, and more particularly with the view of extinguishing the authority of Highland chiefs over their clans, these heritable jurisdictions were abolished; the possessors receiving payment for the assumed value of their rights. Argyll alone received £21,000 as an indemnity, and altogether there was paid by government £152,037, 12s. 2d. The abolition of these odious jurisdictions being followed by the appointment of sheriffs on a proper footing, this great legislative act marks an important era in the history of Scotland. See the Duke of Argyll's *Scotland as it was and as it is* (1887).

Heritor, in the law of Scotland, is the owner of land in a parish liable to public burdens. The heritors, collectively, have vested in them the fee of the church and churchyard; they repair the parish church and manse, or rebuild them where necessary, and before the Education Act (1872) elected the parish schoolmaster.

Her'komer, HUBERT, artist, was born at Waal, in Bavaria, in 1849, the son of a woodcarver who came to England in 1857. At the age of thirteen he gained a medal at the Southampton art school, and afterwards studied for a few months at Munich and South Kensington. In 1870 he settled in London, where, besides painting, he employed himself in preparing designs for the *Graphic*. He has since exhibited a large number of works in water-colour and oil, including figure-subjects and portraits. His best picture is 'The Last Muster' (1875), a picture of Chelsea pensioners in chapel. In 1879 he was elected A.R.A., and in 1885 Slade professor at Oxford, being re-elected in 1889; he is also an honorary member of the academies of Vienna and Berlin, and an officer (1889) of the Legion of Honour. He became R.A. in 1890. An engraver, wood-carver, playwright, and musician, he founded an art-school at Bushey (q.v.).

Herkulesbad (or *Mehadia*), a Hungarian watering place, 20 miles north of Orsova by rail; its eighteen warm springs, 'the waters of Hercules,' have been used since Roman times.

Herma. See HERMES, ALCIBIADES.

Hermandad, THE (Sp., 'brotherhood'), had its rise in an association of the principal cities of Castile against the nobles who in 1282, under Prince Sancho, rose against Alfonso X. When Sancho succeeded to the throne (1295) the league was more firmly organised throughout Castile and Leon, with the express object of resisting the tyranny and exactions of the crown-vassals and nobles. Ferdinand and Isabella, in order to curb the power of their feudatories, first favoured the association and ultimately (in 1485) gave it a legal status under the name of the Hermandad. It now constituted a confederation of the entire burgher class for police and judicial purposes, with local courts and an annual meeting of deputies from all the cities; and the sovereigns, adopting its members as a standing force to counterbalance the followers of the feudal lords, put themselves at the head of the association, placed it at the service of the city magistrates, and employed it both in quelling disturbances and in seizing confiscated properties. The introduction of a regular standing army enabled the crown to free itself from this dependence on the towns; and with the decay of the Hermandad disappeared the last vestige of popular freedom.

Hermann. See ARMINIUS.

Hermann, JOHANN GOTTFRIED JAKOB, a German classical scholar, was born at Leipzig, 28th November 1772. He studied there and at Jena, and was made in 1798 extra-ordinary professor of Philosophy at Leipzig; in 1803, ordinary professor of Eloquence; and in addition, in 1809, professor of Poetry. He died as senior of the university, 31st December 1848. The first department which he began to cultivate on original principles was the science of classical metre, of which he attempted to develop a philosophical theory, based upon the categories of Kant; on this subject he wrote, besides his *Handbuch der Metrik* (1798), several Latin treatises, among which the *Epitome Doctrinæ Metricæ* (1818) reached a fourth edition in 1869. Of wider importance, however, was the new method which he introduced into the treatment of Greek grammar, and which has had its influence on the grammar of Latin and of German. The principles of this method are explicitly developed in *De Emendanda Ratione Græcæ Grammaticæ* (1801), and are practically illustrated in his numerous excellent editions of the ancient classics. Hermann's power of dealing with chronological, topographical, and personal questions is shown in his *Opuscula* (8 vols. 1827–77), which also contain some poems breathing the spirit of Roman poetry. See Memoirs by Jahn (1849) and Köchly (1874).

Hermannstadt (Lat. *Cibinium*, Hung. *Nagy Szeben*), a town of Hungary, formerly capital of Transylvania, is situated at the terminus of a branch-line (28 miles long), 370 miles SE. of Pesth. It consists of an upper and a lower town, the walls, towers, and bastions formerly surrounding which have only recently been demolished. Hermannstadt is the seat of a Greek archbishop and of a 'Saxon university. The fine Bruckenthal palace contains a picture-gallery, numismatic, antiquarian, and mineral collections, and a library of some 30,000 volumes. Tanning, wax-bleaching, and the making of cloth, paper, candles, sugar, and hats are carried on. Pop. (1891) 21,465, of whom 15,000 are Germans. Hermannstadt was originally the seat of a German colony, founded in the reign of Gesa II. (1141–61), and was at first called *Villa Hermanni*. It has endured several sieges from the Turks (1438 and 1442), as well as one from the followers of John Zapolya (1526). It also suffered at the hands of Gabriel Bathori in 1610, and again from both combatants during the Russo-Hungarian war of 1849.

Hermaphroditism, the combination of the essential male and female functions and structures

in one organism, as in most flowering plants, or in many lower animals, such as earthworm, leech, or snail. The name is derived from the fable of the union into one of the bodies of Hermaphroditus, son of Hermes and Aphrodite, and the nymph Salmacis—see Ovid's *Metamorphoses*, iv. 347. The combination of two sexes in one occurs, however, in various degrees, the bisexuality being sometimes very intimate, and in other cases only superficial. (*a*) It is probable that many animals—e.g. frogs, which are unisexual in adult life—pass through a period of *embryonic* hermaphroditism, early nutrition having much to do with the more or less complete predominance of one sex over the other. (*b*) Among fishes and amphibians and elsewhere, *casual or abnormal* hermaphroditism is not infrequent, the animal having for instance an ovary on one side and a testis on the other. (*c*) In other cases only one organ is developed, and one sex emphatically predominates in the organism, not, however, without hints of the other. This *partial* hermaphroditism is usually an exception, as when a butterfly has its wings coloured like those of the female on one side, like those of the male on the other. Frogs and toads also illustrate curious combinations, which do not, however, conflict with the predominance of the egg-producing or the sperm-producing function as the case may be. (*d*) An apparent, but in reality *false* hermaphroditism may result in the higher animals where, by malformation or rudimentary development of the external reproductive organs, a mammal in reality quite female may look like a male, or *vice versâ*.

(*a*) *Normal adult hermaphroditism*, where egg-producing and sperm-producing functions go on (usually at different times), is rare among higher animals—occurring in Chryophrys and Serranus among fishes, in the hagfish Myxine, and in all the Tunicata. It is, however, of frequent occurrence in the invertebrate series—among snails, bivalves, cirripedes, worm-types, cœlenterates, and sponges. It is most familiar in our common flowering plants, which are often called *monoclinous* or *perfect*.

Hermaphroditism may be more or less intimate. Thus, as an entire plant an Arum is hermaphrodite, with female flowers below and male flowers above; but the hermaphroditism is more intimate in a buttercup, where each flower bears male and female organs, or yet more intimate in an orchid, where stamens and carpels are united. So a leech, with ovaries quite distinct from the testes, is less intimately hermaphrodite than a snail, where within the same small organ both kinds of sex elements are produced.

The male and female elements, whether in phanerogam or invertebrate, are rarely, if ever, matured at the same time. Such a 'want of time-keeping' is called in botanical language dichogamy, and is one of the conditions which tend to prevent self-fertilisation. Protandrous dichogamy, where the stamens take the lead, is much commoner than protogynous dichogamy, where the carpels mature first. This is also true of animals, and is more marked when the hermaphroditism is intimate, as in snail or oyster. The hagfish seems to be predominantly male till it attains a certain size; and so in the curious thread-worm Angiostomum and in the crustacean Cymothoidæ the organs are first male and then after a while female. In the cirripeds and Myzostomata, the majority of which are bisexual, pigmy or complemental males are in some cases associated with the hermaphrodites, or in the case of the barnacles (in which separate sexes sometimes occur) even with some of the females.

Alike in plants and in animals, though hermaphroditism is common, self-fertilisation is rare. It does occur in not a few common flowers, and in tapeworms, some flukes, and a few other animals, but is without doubt exceptional.

Hermaphroditism is commonest in sluggish animals (e.g. flat-worms, tardigrades, snails), or in fixed animals (e.g. sponges, corals, Polyzoa, bivalves, Tunicates), or in parasitic animals with a plethora of nutrition and little exertion (e.g. flukes, tapeworms, leeches, Myzostomata).

As to its origin, hermaphroditism is probably the lower, more primitive condition from which that of unisexuality has been in the majority of cases evolved. In alternating rhythms eggs and sperms were produced, gradually the areas of their respective formation were restricted, by-and-by one tendency predominated in the organism, and separate males and females were established. If embryonic hermaphroditism be, as some believe, of general occurrence, then most organisms recapitulate this evolution of separate sex in their individual life-history. If it be allowed that hermaphroditism was the primitive condition, then the cases now existing indicate either persistence or reversion. See EMBRYOLOGY, REPRODUCTION, SEX; and Geddes and Thomson, *The Evolution of Sex* (Lond. 1889). For aberrant hermaphroditism in human adults, see Todd and Bowman's *Cyclop. of Anat. and Physiol.*, vol. ii.

Hermas, as the author of the well-known early treatise called *The Shepherd*, is usually reckoned one of the Apostolic Fathers (q.v.). The work is quoted as inspired by Irenæus and Clement of Alexandria. To the Montanist Tertullian it is 'that apocryphal Shepherd of the adulterers;' but Eusebius, while he places it in his list of spurious or rejected books, witnesses that it had been read publicly in the churches. And indeed the 'commandments' were read here and there in the Eastern Church from the 4th to the 15th century, though nowhere with the honour of Scripture. The date and the authorship are both in dispute. The suggestion first advanced by Origen, in the 3d century, that the Hermas mentioned in Romans might be the author, may be dismissed in company with the assertion of the Ethiopic scribe that Hermas was none other than St Paul. The statement of the writer of the Muratorian Fragment has been generally accepted, that Hermas was the brother of Pius I., Bishop of Rome about the middle of the 2d century, and that he wrote during his brother's episcopate; but the form of church government that appears in *The Shepherd* is against this tradition, as perhaps is also the jealousy the writer displays of those who are ecclesiastically his superiors; and moreover the treatise was already in general use considerably before the end of the century. From these and other considerations there has been in recent years a tendency to throw the date back to the beginning of the 2d century, and to identify a certain Clement who is mentioned with Clement (q.v.) of Rome. This last point is a mere assumption, but in favour of the earlier date is most of the internal evidence, as well as the fact that the book was read in public—an honour restricted in every other instance to writings accepted as those of the Apostles or their immediate disciples; against it are the allusions to the persecutions suffered by the Christians, the condition of the Roman Church, and the absence of all reference to Judaising Christians. Finally, Donaldson's theory that the name Hermas is fictitious, and the whole work an allegory, appears to be based on a misconception. The treatise, which is divided into three parts—visions, commandments, and similitudes—contains little of positive dogmatic teaching, but is an interesting monument of early Christian thought; it was intended primarily

to rebuke the worldliness that had come upon the church, and to turn sinners to repentance.

Latin translations were in use before the end of the 2d century, and for long the work was known only through a score of MS. copies of one of these versions. A second Latin version has been discovered, however, as well as an Ethiopic version, found by D'Abbadie in 1847, and edited by him with a Latin translation (Leip. 1860). Of the Greek text the Codex Sinaiticus supplies about one-fourth, to nearly the end of the fourth commandment; the rest, except about seven short chapters, is in the Athos MS. Considerable portions are found in Pseudo-Athanasius and Antiochus Palæstinensis, who have borrowed extensively from Hermas without acknowledgment. In 1890 the discovery of a new Greek codex, contemporary with the Sinaiticus, and containing the whole of Hermas, was announced. There is a 'complete' Greek text by Hilgenfeld (1888), who has also edited the Latin form (1873); and a *Collation of the Athos Codex* has been made by Dr Spyr. P. Lambros (trans. with preface, &c., by F. A. Robinson, Camb. 1888). There is a good edition of Latin and Greek by Gebhardt and Harnack (1877). See also Zahn, *Der Hirt des Hermas* (1868); Donaldson, *The Apostolical Fathers* (1874); Salmon's *Introduction to the New Testament* (4th ed. 1889); and *Johns Hopkins University Circulars*, iii. 75 and iv. 23.

Hermeneutics. See EXEGESIS.

Hermes, on the testimony of art and literature alike, was more intimately connected with the everyday life of the Greeks than was any other of their gods. In the country his images were erected on mountains, in caves, by the side of streams, by the roadside, where they served as finger-posts, and on the marches, where they served to delimit the frontier. In towns the gate by which one entered the city and the door by which one entered a house were under the protection of an image of this deity. The streets of the city, like the roads of the country, were marked by statues of Hermes (Lat. *Hermæ*). Inside the house as well as outside its doors the likeness of Hermes was to be found. The agora or market-place of every city was especially under the protection of this deity, and possessed a statue of him. The gymnasium and palæstra also were decorated with likenesses of their patron god Hermes. Finally, in the very grave the Greek was accompanied by Hermes, the conductor of souls.

From what has been said it is obvious that the functions ascribed to Hermes, the son of Zeus and Maia, must have been very considerable in number and range. In the first place, he was regarded unanimously and from the beginning as the herald and messenger of Zeus, and in virtue of this character he is represented in art with the herald's staff, with wings on his feet or shoulders, and a traveller's hat of felt, low in the crown and broad in the brim, on his head. It seems natural in the next place to attribute Hermes' function as god of the training ground to the speed of foot which he as the herald of the gods was credited with. Again, Hermes was the patron of thieves, and he himself, according to the 'Hymn to Hermes,' commenced a thief's career by stealing the oxen of Apollo when he was but a few hours old. At the same early age, according to the same authority, Hermes invented the lyre, which he constructed out of the shell of a tortoise. The invention of the flute and the syrinx also was ascribed to this deity. The function of conducting the spirits of the departed to the next world, and the closely-related function of bringing dreams to mortals, probably were part of his duties as the messenger of the gods, but are of so much importance that they need separate mention. A function apparently quite unconnected with any already mentioned is that of securing fertility to flocks and herds, and generally of preserving health. We have already noticed that roads and streets in Greece were under the especial care of Hermes; we must then connect this fact with the circumstance that Hermes was the patron of travellers, merchants, and commerce generally. Finally, Hermes was the god of unexpected good-luck; what we call a godsend the Greeks called a Hermaion.

As to the origin of Hermes comparative mythologists are disagreed, though perhaps not more so in his case than in the case of other gods. He has been regarded as the god of fertilising rain, as the evening twilight or the light of dawn, as a cloud-god, as a nether-world god, and of course as a solar god. It is objected to these explanations that they only account for some and not for all of his functions. Thus, the fertilising rain would explain his function of causing fertility (were it not for the fact that it is the fertility of flocks and herds that Hermes is concerned with), and the pleasant sound of the falling rain might explain his connection with music. But the other functions find no explanation or but a forced one in this theory. It has been therefore argued (by Roscher, *Hermes der Windgott*) that Hermes is a wind-god. The wind is the divine messenger sent from Zeus (the sky) to man. The wind sweeps down from the mountain-tops, where again the images of Hermes were placed. The swiftness of the wind is indicated by the wings on the heels or the shoulders of the god. The winds carry things away, even as the thief Hermes. The wind, like Hermes the inventor of the flute and the lyre, makes sweet music. Ghosts that are but thin air, belong to the domain of the air, and are under the dominion of the wind-god. The gentle zephyrs not only favour the growth of plants, but, according to ancient notions, conduced to the fertility of flocks and herds. The winds also blow away foul air and miasma, and the wind-god is therefore properly the god of health. The changing wind has ever been the symbol of fickle fortune and unexpected luck, and Hermes is the god of unexpected good-fortune. Travellers are especially dependent on wind and weather, and hence on Hermes. Again, various epithets which are applied to this god and have caused much trouble to scholars can be explained on this theory. *Argeiphontes* is the god who makes the sky clear, as does the wind. *Diaktoros* is the chaser. The name Hermes itself, or rather the older form *Hermeias*, corresponds phonetically to the Sanskrit *Sarameyas*, and is derived from the root *sar*, 'to hasten,' whence comes the epithet *Saranju*, applied to the Hindu Maruts, gods of the storm-wind.

That this explanation of the origin and functions of Hermes explains everything cannot be denied. Whether it is the right explanation is another matter. Apart from the fact that there are not many things for which an analogy could not be found in the action of the wind, it may be doubted, as a matter of general principle, whether we ought to look for one idea from which to deduce all the functions of a god. We may borrow an illustration from comparative syntax: no one would now think of trying to deduce all the meanings of the Greek genitive from one single central idea. In the first place, the Greek genitive conceals beneath it several cases (just as the Greek Heracles conceals several different local heroes), such as the ablative, the instrumental, &c.; and, in the next place, even the uses of the genitive proper were not as a matter of history all evolved out of one nebulous use equidistant from all subsequent uses. The extension of the meaning of a case, like the extension of the meaning of a word, is due to analogy, to its application to expressions new but analogous to those in which it was first employed. The same principle of extension by 'contiguity,' as logicians call it, in all probability explains the heterogeneous functions ascribed to any one particular god.

To seek for some notion common to them all may be as mistaken a proceeding as it would be to seek to derive the idea of the grave and the idea of horse-racing from some idea equidistant between the two, because 'the turf' bears both meanings.

Finally, the beauty which characterises the statue of Hermes in the zenith of Greek art (the so-called Antinous of the Belvedere) is a Hermes) naturally belongs to the patron god of the gymnasium and the palæstra, while the celebrated statue of Hermes by Praxiteles portrays the god of the principle of fertility, in whose care all young things were, and to whom therefore it fell to tend his young brother Dionysus. For Hermes Trismegistus, see HERMETIC BOOKS.

Hermes, GEORG, a Roman Catholic philosopher and divine, was born at Dreyerwalde, in Westphalia, April 22, 1775. He studied at Munster, became theological professor there in 1807, and in 1819 at Bonn. At Bonn he died, May 26, 1831. In his chief works, *Die Innere Wahrheit des Christenthums* (1805), *Philosophische Einleitung in die Christ-Katholische Theologie* (1819), and *Christ-Katholische Dogmatik*, he sought to base the Catholic faith and doctrines on a critical theory of knowledge like Kant's. The Hermesian method of investigation in like manner discards, in the first stages, and so far as investigation is permitted to extend, all principle of authority; and in the details of metaphysical inquiry, in the selection of the arguments of the existence of God, and of the nature of divine attributes, he departed widely from the old text-books of the schools; although in the general sum of the doctrines of the Roman Catholic Church his orthodoxy does not appear to have been in any degree called into question. Soon many theological and philosophical chairs were filled by *Hermesians;* and it was not till after the death of Hermes that his doctrines were condemned by the pope (1835), and some professors deprived of their chairs. The controversy was continued, as well in Rome as in Germany, for a considerable time; by degrees, however, the Hermesian party fell away. See works on Hermes and his movement by Esser (1832), Elvenich (1836), Niedner (1839), and Stupp (1845).

Hermetic Books, the sacred canon of the ancient Egyptians, consisted of forty-two books, divided into six sections. They constitute what is virtually an encyclopædia of Egyptian wisdom, in that they treat of religion, the arts, and science—the nature of the gods, laws, liturgical rites and ceremonies, hymns, hieroglyphics, geometry, astronomy, medicine, and cosmography. The name 'hermetic' comes from Hermes Trismegistus ('Hermes Thrice-greatest'), the Greek name of the Egyptian god Thoth, who was regarded as the originator of Egyptian culture, the god of writing, of religion, and of the arts and sciences. Neither the time at which these books were actually written, nor the author or authors who wrote them, can now be determined. They are evidently based upon the Egyptian mythology, but at a time when it was beginning to feel the influence of Hellenistic culture, since traces of Neoplatonist ideas can be discerned in them, as also indications of the influence of the Jewish philosopher Philo. The Greek and Latin texts of the hermetic books exist, but only fragmentarily, in the writings of such writers as Stobæus, Cyrillus, Suidas, and Lactantius. The greater part of these pieces have been published by Parthey (*Hermetis Trismegisti Pœmander*, 1854), and again by Ménard (*Hermès Trismégiste*, 1866). The *Papyrus Ebers* (1875) is generally accepted as being one of the medical books of the series. The teachings of Thoth were at first regarded as esoteric doctrines, and as such jealously guarded by the sages and from them transmitted to their pupils, these depositions of the sacred lore making what was called the *hermetic chain*. Thoth was also the inventor of magic and alchemy, whence the latter was sometimes called the *hermetic art*, and whence are derived the terms *hermetic medicine*, *hermetic freemasonry*, and *hermetically sealed*, this last to signify the closing of a box or jar or other receptacle in such a way as to exclude absolutely the atmosphere.

Hermit (Gr. *eremitēs*), a name given in the early ages, and still more in the later church, to a solitary ascetic, who, with a view to more complete freedom from the cares, temptations, and business of the world, took up his abode in a natural cavern or a rudely formed hut in a desert, forest, mountain, or other solitary place. In the first centuries the names of eremite and anchorite (Gr. *anachōrētēs* = 'one who retires'—i.e. from the world) were indiscriminately applied to these solitaries; but, the word *eremita* having been adopted into Latin, 'hermit' is more commonly used in the modern languages which are derived from that tongue. Hermits began to appear in the Christian church in the 3d century. The advocates of Asceticism (q.v.) were the first to set the example of retiring from cities to rural districts and villages. But the hermits went further, and sought to withdraw altogether from mankind, that they might give themselves up to a life of solitary but holy contemplation. The earliest hermit is said to have been Paul of the Thebaid (Egypt), who during the Decian persecution fled for safety to the desert (250); there he lived for the rest of his life, dying, 113 years old, about 342. The fame of his sanctity quickly incited others to imitate his mode of life. The most famous amongst these successors was St Anthony (q.v.). At the time of his death (365) hermit cells existed in considerable numbers in the deserts of Egypt, Syria, and Palestine. But the hermits were not always able to preserve their solitude unbroken. The fame of their sanctity drew many to visit them, partly out of curiosity, partly to enjoy pious converse with them, or to get religious advice from them, partly also in the belief that diseases, particularly mental diseases, were cured by their blessing. Sometimes they returned for a short time to the midst of their fellow-men to deliver warnings, instruction, or encouragement, and were received as if they had been inspired prophets or angels from heaven. The Stylites (q.v.) or pillar-hermits, who spent their lives on the tops of columns, and similar eccentric beings, were a base caricature of the true hermit, men in whom the good spirit of asceticism had become perverted by exaggerated fancy or pride or passion. But the number of hermits gradually diminished as the cœnobite life of convents grew into fashion. Indeed the institution at no time secured the same footing in the Western Church that it did in the Eastern; and perhaps the reason may in part be found in the difference of climate, which renders a manner of life impossible in most parts of Europe that could be pursued for many years in Egypt or Syria. Partial revivals of the practice continued to be made, however, during some centuries, St Cuthbert (q.v.) being a case in point. The name hermit was in still later ages applied to those eccentric individuals who separated themselves from their fellow-men to live in caves or solitary huts, not from any religious motives, but from a morbid aversion to human society or an inordinate love of solitude. See MONACHISM, and Charles Kingsley's *Hermits* (1869).

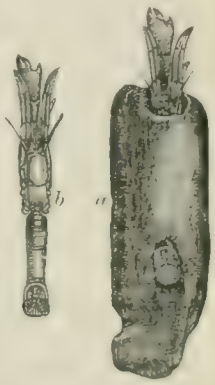
Hermitage. See WINE.

Hermit-crab, a name applied to the members of a family of crustaceans (Paguridæ), notable for their habit of sheltering themselves in gasteropod shells, and for the soft skinned and generally unsymmetrical tail, probably in part the cause and in part the consequence of this curious custom. The eyes are borne on long stalks; the great claws are very large and generally unequal, one being used to close the entrance of the shell into which the hermit can wholly retract himself; the abdominal appendages are practically aborted, with the exception of those at the tip of the tail, which hold so firmly on to the spire of the inhabited shell that it is difficult to pull out the crab unbroken. There are a great many different kinds of hermit-crabs, and these utilise many forms of gasteropod shell, not always keeping constant to one type of house. The commonest species (*Pagurus* or *Eupagurus bernhardus*) is usually found tenanting the shells of the whelk (Buccinum); while

Common Hermit-crab shifting from one whelk shell to another.

another very common species (*P.* or *E. prideauxii*) may be found inside shells of Fusus, Murex, Cancellaria, Turbo, Buccinum, &c., and is also very interesting as an illustration of partnership or Commensalism (q.v.) with a species of sea-anemone which forms a cloak round the shell. It masks the hermit-crab, and may also be useful on account of its stinging-cells, while the hermit-crab repays the anemone by carrying it about, and doubtless also with debris of food (for illustration, see Anemone). This habit of helpful partnership has been observed even in *Pagurus abyssorum* from a depth of 3000 fathoms. As hermit-crabs grow they have not only to cast their own armature in the usual crustacean fashion, but they must periodically shift to a successively larger and larger house. In looking out for a new shell to tenant hermit-crabs are naturally in a hurry, being then in a position of defencelessness unusual for them; and it has been observed that they do not always seek for an empty mollusc shell, but may evict the rightful owner of one which strikes their fancy. The common hermit-crabs feed on molluscs and animal debris. They are most interesting inmates of aquaria, but their voracity is very apt to reduce the population.

Some of the deep-sea hermit-crabs, brought up by the *Challenger*, *Blake*, and other explorations, are of much interest, especially perhaps inasmuch as several retain the symmetry which the more familiar forms tenanting spiral shells have lost. As such shells are rarities at the bottom of the deep sea, some of the hermits retain the doubtless original free life. Such is *Tylaspis anomala*, from the south Pacific at a depth of 2375 fathoms, which has a very much shortened abdomen, with distinct segments, however, and well-developed symmetrical appendages. From the West Indies the *Blake* obtained *Pylocheles agassizii*, living in straight tubes of compacted sand, and quite symmetrical. Even more interesting is the symmetrical *Xylopagurus rectus*, living at depths of 300 to 400 fathoms, in open tubes of wood or bamboo-stem, into which the animal retreats head foremost, and guards the opening with firm plates on the end of the tail.



Xylopagurus rectus in its case (*a*) and free (*b*).

The members of the genus Cœnobita, from the shores of the Indian Ocean and other warm seas, live in all sorts of houses, including the shells of marine gasteropods (Murex, Purpura, &c.), of landsnails, of sea-urchins, or even nuts. One species, *C. rugosa*, is famous for its fondness for cocoa-nuts, and for its excursions ashore. In another genus, the robber hermit-crab (*Birgus latro*), from the West Indies, lives in holes in the earth under trees, has an almost lung-like modification of the gill-cavity for breathing air directly, yet visits the sea periodically by night. It feeds on cocoa-nuts, though it does not climb for them, and is itself eaten in Amboyna and elsewhere. Darwin has graphically described how it tears the husk from the cocoa-nuts, and hammers on the round depressions at one end until entrance is effected. Out of a biscuit-box, the lid of which was fastened down with wire, a robber-crab made its escape, actually punching holes in the tin and turning down the edges.

See Commensalism, Crab, Crustacea; J. R. Henderson, *Challenger Report on Anomura*; Agassiz, *Voyage of the Blake*; Marshall, *Das Tierleben der Ostsee* (Leip. 1888); and Darwin, *Voyage of the Beagle* (Lond. 1845).

Hermodactyl. See Colchicum.

Hermon, Mount (now *Jebel es Sheikh*), 9150 feet high, is the culminating point of the Anti-Libanus range. See Lebanon.

Hermopolis Magna, an ancient town of Egypt, situated on the Nile, on the border of the Thebaid, and near the frontier line of upper and middle Egypt. Thanks to its position, Hermopolis grew to be a place of great importance, ranking next after Thebes. It had a celebrated temple sacred to Thoth, the ibis-headed god of letters, of which the portico alone is all that now remains. On the opposite or right bank of the Nile was Antinoöpolis, where the dead of Hermopolis were taken for burial. The modern name of Hermopolis is Ashmun or Eshmoon.

Hermosillo, capital of the Mexican state of Sonora, stands in a fertile plain on the Rio Sonora, 50 miles by rail N. of the port of Guaymas. It has a mint and other government buildings, a bank of issue, sawmills, distilleries, and shoe and furniture factories, and a large export trade in wheat and wine. Pop. 15,000.

Hermoupolis. See Syra.

Hermus, a river of Asia Minor, flowing through the plain of Sardis, and falling into the Gulf of Smyrna.

Herne Bay, a watering-place of Kent, 12 miles W. of Margate. Founded in 1830, it has a pier 1213 yards long, an esplanade 1 mile long, and a handsome clock-tower. Bishop Ridley was vicar of Herne in 1538–40. Pop. 2816.

Herne the Hunter, a figure in popular tradition, long supposed to range at midnight around an ancient oak in Windsor Forest. He is referred to in Shakespeare's *Merry Wives of Windsor*, and Herne's Oak continued to be an object of interest until it was blown down on 31st August 1863. The Queen planted a young oak on the spot where the patriarch had stood, as was supposed, for 650 years.

Hernia (Lat.; probably from Gr. *ernos*, 'a sprout'), in its widest sense, signifies a protrusion, through an abnormal or accidental opening, of any organ from its natural cavity. Although hernia may occur in many parts of the body, the word, used by itself, is restricted to signify protrusion of the abdominal viscera, the condition popularly called *rupture*.

The way in which hernia may arise will be readily understood if we bear in mind that the abdominal viscera are subject to constant pressure from the diaphragm and other surrounding muscles. If at any point the walls of the belly are not sufficiently strong to resist this pressure some portion of the viscera is driven through them, and a hernial tumour is formed. Certain parts of the abdominal walls, especially the inguinal and crural rings, and the umbilicus, being weaker than others, hernia most frequently occurs at these points. In some instances hernia is congenital, from abnormal deficiency of the walls; in other cases it may arise at any period of life as a result of violent bodily exertion. Sex, age, and occupation seem to have a marked influence in predisposing to hernia. Men are far more liable (in about the proportion of four to one) to this disease than women; though they are less so to those forms of the affection known as femoral and umbilical hernia. According to Malgaigne, in France one man in thirteen, and one woman in fifty-two, are the subjects of hernia. In respect of age he found that the liability is least about the age of thirteen (one in seventy-seven), after which it progressively increases until the close of life, rising at seventy to seventy-five to one out of every three.

A hernia is almost always composed of *a sac* and *its contents*. The sac is a portion of the Peritoneum (q.v.) corresponding to the aperture at which the hernia protrudes. It is pushed forward by the protruding viscera, and forms a pouch. The contents vary greatly, but generally consist of a portion of the small intestine (particularly of the ileum), forming the variety of hernia known as *enterocele*. Omentum is often found in hernial sacs, either with or without intestine. Besides the viscera, the sac always contains a certain quantity of fluid secreted by its interior. Hernia is divisible (1) into *reducible*, or returnable into the abdomen, *irreducible*, and *strangulated;* and (2), according to its situation, into *inguinal*, *femoral*, &c.

The treatment of reducible hernia may be palliative or radical. The palliative treatment consists in the application of a truss (see below) to retain the protrusion within the cavity of the abdomen. Each particular kind of hernia (femoral, umbilical, &c.) requires its special form of truss; and before applying it the hernia must be reduced by placing the patient on his back, relaxing the muscles by bending the thigh upon the abdomen, and pressing the tumour back in the proper direction. The truss should then be put on, and should be worn during the whole of the day; and if the patient will submit to wear it (or a lighter one) during the night, so much the better. The means that have been contrived to effect a radical cure are too purely surgical for description in these pages. Below the age of puberty, and if the hernia is recent, a radical cure is sometimes effected by wearing the truss for two or three years.

In irreducible hernia the protruded viscera cannot be returned into the abdomen, but there is no impediment to the passage of their contents or to their circulation. In these cases the patient is often liable to dragging pains in the abdomen, and to attacks of vomiting, in consequence of the movements of the abdominal organs being checked by the omentum or intestines being fixed. There is also constant danger of this hernia passing into the strangulated form. The treatment may be either palliative or radical. The palliative treatment consists in the employment of a truss with a hollow pad that shall embrace the hernia, and prevent any additional protrusion. An irreducible hernia may *sometimes* be converted into a reducible one by keeping the patient in the recumbent position, and on very low diet, for two or three months; at the same time keeping the bowels open by laxatives and injections, and maintaining equable pressure over the tumour. Radical cure is, as in the case of reducible hernia, by operation.

Hernia is said to be strangulated when a portion of intestine or omentum that is protruded is so tightly constricted that it not only cannot be returned into the abdomen, but has its circulation arrested. This form is highly dangerous, because, if relief is not speedily afforded, the strangulated part becomes gangrenous. The causes of strangulation are various, but this condition most commonly arises from a sudden violent effort, by which a fresh portion of intestine is driven into a pre-existing hernia, which it distends to such a degree as to produce this complication. The most prominent early symptoms are flatulence, colic pains, &c. They are succeeded by vomiting first of the contents of the stomach, then of mucus and bile, and lastly of fæcal matters, owing to inverted peristaltic action. If relief is not obtained the inflammation that commences in the sac extends to the peritoneum, and the ordinary signs of peritonitis appear. After a variable time comes gangrene or mortification of the part, and the patient speedily sinks.

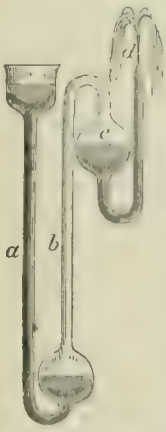
The surgeon first tries to return the intestine, as in the preceding cases. This manipulation, termed the taxis, may be assisted by the internal use of chloroform, inhaled till it produces complete relaxation of the muscles, by the hot bath, &c. If this fails he must have recourse to the knife to divide the constriction.

The necessity of having recourse to a suitable truss the moment that the slightest protrusion shows itself in any of the parts liable to hernia cannot be too strongly urged as a matter of necessary general knowledge. At whatever period of life a hernia occurs, if properly attended to and judiciously supported, it usually gives little trouble, and if it occurs in early life, it may often be cured; whereas, if it be neglected, increase of bulk, and, subsequently, diseased states of the parts, often terminating in death, will almost certainly occur. A *truss* consists essentially of a pad or cushion attached to a metallic spring, with straps so arranged that its position may be retained during the varied postures of the body. A surgeon should always be consulted in the choice of the instrument. 'The practice,' says Mr Birkett, 'of leaving cases of rupture in the hands of mere tradesmen cannot be too strongly censured. Amongst the poor we constantly observe the lamentable effects of this proceeding.' Many varieties of trusses have been invented. There are occasional

cases in which the common truss fails to support a rupture comfortably, and in these cases various instruments, for the most part the property of special instrument-makers, are often serviceable. The patient must expect to find the truss somewhat uncomfortable for a week or two, but will soon get used to it. The skin of the part upon which it presses should be regularly washed and bathed with eau de Cologne or spirit, as, without this precaution, boils are apt to form on it.

Hero, a priestess of Aphrodite, who loved and was beloved by a beautiful youth named Leander, whose home was at Abydos, on the opposite shore of the Hellespont. Hero's position as a priestess, and the will of her parents, were obstacles to their union, but Leander every night swam across the Hellespont to visit his beloved, directing his course by a lamp that burned on the top of a tower on the seashore. But one tempestuous night the light was extinguished, and Leander was drowned. Hero, when she saw his dead body washed ashore at daybreak, threw herself down from the tower into the sea and perished. A poem on this theme has come down to us under the name of Musæus; the romantic story is alluded to by Ovid, Virgil, and Statius; and in modern times Marlowe, Schiller, and Leigh Hunt have retold it in verse, whilst Grillparzer has made it the subject of a drama.

Hero OF ALEXANDRIA (Gr. *Herōn*), a great mathematician and natural philosopher, was a pupil of Ctesibius, and flourished about 100 or 150 B.C. He seems to have invented a great number of machines and automata, among which are Hero's fountain; a steam-engine on the same principle as Barker's mill; a double forcing-pump used for a fire-engine, and various other similar applications of air and steam. Among his works which have come down to us the most notable is on Pneumatics; Hultsch edited the remaining fragments of his geometrical works in 1864.—Another Hero, called Hero the Younger, who wrote on mechanics and astronomy, long had the credit of writing some of his namesake's books. According to some authorities he flourished at Alexandria in the 7th century A.D.; according to others, at Constantinople in the 10th.—HERO'S FOUNTAIN is a pneumatic apparatus, through which a jet of water is supported by condensed air. A simple mode of constructing it by means of glass tubes and a glass-blower's lamp is shown in the annexed figure. The column of water in the tube *a* compresses the air in *b*; this presses on the surface of the water in *c*, and causes it to gush out at *d*.



Hero's Fountain.

Herod, the name of a family which rose to power in Judæa during the period which immediately preceded the complete destruction of the Jewish nationality. The family was of Idumean descent; but, though alien in blood, was Jewish in religion, the Idumeans having been conquered and converted to Judaism by John Hyrcanus, 130 B.C. (1) HEROD THE GREAT was the second son of Antipater, who was appointed procurator of Judæa by Julius Cæsar, 47 B.C. At the time of his father's elevation Herod, though only fifteen years of age, was made governor of Galilee, and afterwards of Cœle-Syria; and ultimately he and his elder brother were made joint-tetrarchs of Judæa. But he was soon displaced by Antigonus, the representative of the Hasmonean dynasty, and forced to flee to Rome, where he obtained, through the patronage of Antony, a full recognition of his claims, and became tetrarch of Judæa, 40 B.C. Several years elapsed, however, before he succeeded in establishing himself in Jerusalem. On the fall of Antony he managed to secure a continuance of favour from Augustus, from whom he not only obtained the title of king of Judæa, but also a considerable accession of territory, 31 B.C. From this time till his death his reign was undisturbed by foreign war; but it was stained with cruelties and atrocities of a character almost without parallel in history. Every member of the Hasmonean family, and even those of his own blood, fell in succession a sacrifice to his jealous fears; and in the later years of his life the lightest shade of suspicion sufficed as the ground for wholesale butcheries, which are related in detail by Josephus. The slaughter of the innocents at Bethlehem is quite in keeping with his character; as was also his ordering the death of his wife Mariamne and his two sons by her. The one eminent quality by which Herod was distinguished, his love of magnificence in architecture, was evinced by the grandeur of the public works executed under his direction. Samaria rebuilt and Cæsarea were monuments of his zeal in building. Herod married no fewer than ten wives, by whom he had fourteen children. He died of a painful disease at the age of seventy, the year of Christ's birth—i.e. in the year 4 before the Christian era, as fixed by Dionysius Exiguus (see CHRONOLOGY, Vol. III. p. 227)—after a reign of thirty-seven years.—(2) HEROD ANTIPAS, son of Herod the Great by his wife Malthace, a Samaritan, was originally designed by his father as his successor; but by the final arrangements of the will of Herod the Great, Antipas was named tetrarch of Galilee and Perea. He divorced his first wife, the daughter of Aretas, king of Arabia Petræa, in order to marry Herodias, the wife of his half-brother Philip—an incestuous connection, against which John the Baptist remonstrated, and was in consequence put to death. It was during a visit of Herod Antipas to Jerusalem for the purpose of celebrating the passover that Jesus was sent before him by Pilate for examination. At a later time he made a journey to Rome in the hope of obtaining the title of king; but he not only failed in this design, but, through the intrigues of Herod Agrippa, was banished to Lugdunum (Lyons), where he died in exile.—(3) HEROD AGRIPPA I., son of Aristobulus and Berenice, and grandson of Herod the Great, was educated at Rome. He lived there in a very extravagant style until his debts compelled him to take refuge in Idumea. From this period almost to the death of Tiberius he suffered a variety of misfortunes, but, having formed a friendship with Caligula, he received from him, on his accession to the throne, the tetrarchies of Abilene, Batanæa, Trachonitis, and Auranitis. After the banishment of Herod Antipas he received his tetrarchy also—viz. Galilee and Perea. Claudius added to his dominions Judæa and Samaria, and he was thus the ruler of a more extensive territory than even was Herod the Great. He died at Cæsarea of a painful and incurable malady, 'eaten of worms' (Acts, xii. 23), in the fifty-fifth year of his age, and the 44th of the Christian era.—(4) HEROD AGRIPPA II., son of Agrippa I., was at Rome when his father died, and only seventeen years of age. Claudius therefore resolved to detain him for some time, and in the meanwhile re-transformed the kingdom into a Roman province. In 53 A.D. he left Rome,

and received from the emperor nearly the whole of his paternal possessions, which were subsequently enlarged by Nero. Like his ancestor Herod the Great, Agrippa was fond of building, and spent great sums in adorning Jerusalem and other cities; but he failed to secure the good will of the Jews. He did all in his power to dissuade them from rebelling against the Romans. When Jerusalem was taken he went with his sister to live at Rome, where he was made prætor, and where he died in the seventieth year of his age. It was before him Paul made his memorable defence.

Herodas, or HERONDAS, a Greek poet of the 3d century B.C., probably from the island of Cos, of whose *Mimiambi* (mainly scenes of Greek life in dialogue) only small fragments were known till some 700 verses from eight different poems were recovered from an Egyptian MS. in the British Museum and published by Kenyon (1891). They have since been edited by Bücheler, Crusius, and Meister.

Herodian, a Greek historian, who lived in Rome. His *History*, in eight books, extends from the death of Marcus Aurelius (180) to Gordian III. (238), and is fairly trustworthy. See editions by Bekker (1855) and Mendelssohn (1883).

Herodotus, 'the father of history,' was born between 490 and 480 B.C., between the first and the second of those two Persian invasions of Greece of which he was hereafter to write the history. He was born at Halicarnassus, one of those Greek colonies on the coast of Asia Minor which were conquered by the Persians, and whose efforts to recover liberty were the cause of the Persian wars. Halicarnassus, originally founded by Dorian settlers, had in course of time become an Ionic city, and consequently Herodotus wrote in the Ionic dialect. When the colonies were freed from the Persian yoke the citizens of Halicarnassus differed as to the form of government to adopt, and Herodotus left his native town. His travels were of remarkable extent: he travelled not only over Asia Minor and the islands of the Ægean Sea, but over Greece proper. He spent much time at Athens and at Delphi, and paid visits also to Sparta, Corinth, Thebes, Olympia, and Dodona. He also journeyed to Macedonia, Thrace, and the coasts of the Black Sea. Above all he penetrated to the interior of the Persian empire, to Susa, Ecbatana, and Babylon; and he 'did' Egypt. On the journey thither he visited Tyre, and from Egypt he reached Cyrene. In 443 B.C. the colony of Thurii was founded by Athens, and Herodotus joined it, whether in that year or not is uncertain. From Thurii he visited Sicily and Lower Italy. He lived to the beginning of the Peloponnesian war, 432 B.C., and perhaps not later than 425 B.C., but when, where, or how he died we do not know. Cuneiform inscriptions prove that the revolt of the Medes referred to in book i. 30 took place under Darius I., and not Darius II., so that we cannot infer from the passage that Herodotus was alive at the latter date (409 B.C.).

Herodotus, then, spent a large part of his life in travelling. These travels he undertook for the purposes of his history, and his activity, mental as well as physical, in collecting information and making inquiries, historical, geographical, ethnological, mythological, and archæological, was extraordinary. His history was designed to record not only the wars but the causes of the wars between Greece and the barbarians: thus, as to the Greek the whole world was either Greek or barbarian, he could have no difficulty in finding a place for all his information. The way in which he actually weaves it together is as follows. Beginning with the conquest of the Greek colonies in Asia Minor by the Lydian king Crœsus, he has an opportunity for giving a history of the kings of Lydia and a description of the country. The Lydians were conquered by the Persians, whose history and empire have now to be described. Amongst the conquests of Cyrus were Babylon and the Massagetæ; of Cambyses, Egypt, the account of which fills book ii. In book iii. the organisation of the Persian empire by its great statesman-king, Darius, enables Herodotus to emphasise the contrast between the might and magnitude of Persia on the one hand and the inferiority of Greece on the other. The invasion of the Scyths by Darius in book iv. allows Herodotus to place the remarkably interesting ethnological information he had gathered from the emporiums on the coast of the Black Sea. And the statement that Darius intended to invade the north coast of Africa brings in what Herodotus had learned at Cyrene and on the journey to it. In books v. to ix. we have the history of the two Persian wars.

Herodotus has been called 'the father of history,' but, as we have seen, he has an equal right to be called 'the father of geography.' This combination of history and geography is not a feature which distinguishes him from his predecessors, the 'logographers.' They not only composed chronological lists, containing probably a brief account of the events recorded, but they also composed topographical works, which, however, contained in many cases a history of the places described. Thus history and geography (scarcely discriminated) existed before Herodotus' time, nor did he divide them. But the work of Herodotus is to the bald, brief, disconnected notes of his predecessors what the work of Homer was to the poems of his predecessors. It is the beginning of Greek prose, as is Homer's of Greek verse; but whereas we have no fragment of any of the poets who lived before Homer, we have of the prose-writers before Herodotus, and the advance in point of form is remarkable. In reading Herodotus we feel very strongly that the style is the man, possibly because we know so little of the man; but in any case the character revealed by the style is sympathetic in a high degree, and probably few writers of any age or country have so many devoted personal friends as Herodotus counts amongst his readers. He is so simple, so frank, so talkative, amiable, and respectworthy. He wrote indeed not to be read, but to be heard, like all other classical Greek authors, and he read his history in public at Athens and other places. Thus we may account partly for the fact that we seem to hear him talk rather than to be reading an author. But, beyond the charm of style, Herodotus had the knack of taking interest in the right things—i.e. things which have continued to interest people for 2300 years. On the one hand, he could write in a spirit worthy of the glorious fight for liberty fought by the Greeks at Marathon, Thermopylæ, and elsewhere. On the other, he delighted in the manners and customs of strange peoples, and in things ancient and mysterious. As to his honesty as a historian there is practically no doubt—the author of the *De Malignitate* and Professor Sayce notwithstanding: he never says what he does not believe. He does not apparently suppress alternative versions, and he distinguishes between what he saw and what he was told. He did not believe all that he was told, though he did believe occasionally things which were not true. He is not a scientific historian: what he tells is frequently not history: it is something better—legend. Very possibly he wholly misconceives the strategy of Mardonius, but he preserves the *ēthos* of the Greeks who fought—which is of much more moral importance. His story about Rhampsinitus is altogether unhistorical, but it is not only more interesting but more valuable for the history of the people than hieroglyphic inscriptions recording

the number of captives taken or killed by some king.

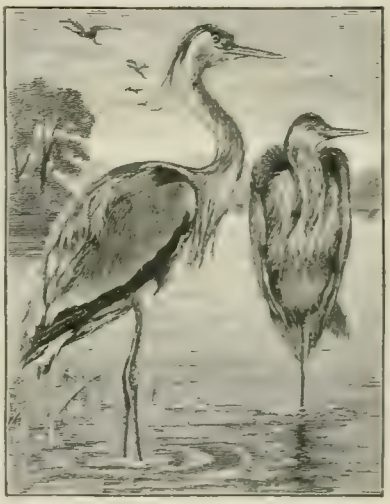
The *editio princeps* is by Aldus (1502). The best critical editions are those by Gaisford and Stein (Berlin, 1869). The best Latin commentary is that of Baehr (Leip. 1856); the best German, Stein (Berlin, 1877); the best English, Rawlinson (4 vols. 1858). The last contains a translation. Another English translation is by G. C. Macaulay (2 vols. 1890). The appendices to Professor Sayce's edition of books i.–iii. are valuable.

Heroes were, in the Homeric period, the kings, princes, generals, leaders, all brave warriors, and men who excelled in strength, courage, wisdom, and experience. Many of these had, on account of such qualities, a fabled origin, half human, half divine, and were honoured after their death with a kind of adoration or inferior worship. These heroes and demigods were recognised as the special patrons or protectors of particular countries, cities, or families, as the Pelopidæ, Atridæ, &c., and temples and altars were raised to them. Poetry exalted the heroic sentiment to sublimity; and poems which celebrate the deeds of heroes are themselves termed heroic. The imaginary time when heroes and other semi-divine beings lived on earth was called the Heroic Age.

Heroic Verse. See METRE.

Hérold, LOUIS JOSEPH FERDINAND, French musical composer, was born at Paris on 28th January 1791, and studied at the conservatoire of music in that city. His earliest successes were achieved with *Mdlle. de la Vallière* (1812), a cantata, which gained him a travelling scholarship; the opera, *La Gioventù di Enrico Quinto* (1815); and the comic opera, *Les Rosières* (1816). None of his succeeding pieces met with success, until the opera *Marie* appeared in 1826. *Zampa* (1831) and *Le Pré aux Clercs* (1832), which followed next, were both decidedly successful; the former is still put on the stage from time to time. Hérold died on 19th January 1833 at Thernes near Paris. See Jouvin's *Hérold, sa Vie et ses Œuvres* (1868).

Heron, a genus (Ardea) and family (Ardeidæ) of birds of the order Herodiones. The Herodiones (which includes also the families of storks, spoonbills, and flamingoes) are large birds covered with long loose down, with large wings, and a hard horny bill longer than the head, compressed from side to side, and united to the skull by firm broad bones. The Ardeidæ are distinguished from the other families by their large hind-toe, which rests on the ground and has a large claw equal in size to the claw of the middle toe, and by the inner margin of the middle toe having a pectinated or comb-like structure. The family comprises five genera—the Herons (Ardea), the Night Herons (Nycticorax), the Bitterns (Botaurus), the Boatbills (Cancroma), and the Tiger-bitterns (Tigrisoma). In the Heron genus—which includes the species commonly known as Egrets—the plumage is beautiful, but seldom exhibits very gay colours, white, brown, black, and slate, finely blended, generally predominating. The body is small in proportion to the length of the neck and the limbs. The neck is usually curved. See the article FLYING (with illustration) for the position of the neck, wings, &c. in flight—when the long legs are carried straight out, projecting like a tail. Herons are very voracious, feeding mostly on fish and other aquatic animals; but they also often prey on snakes, frogs, rats, and mice, and the young of other birds. They are usually shy, solitary birds, going about singly, but at nesting-time congregating in numbers, possibly more from community of purpose than from the true gregarious instinct. The Common Heron (*Ardea cinerea*) measures about three feet from the point of the bill to the tip of the tail. It is of a delicate gray colour on the upper parts, the quill-feathers are black, the tail of a deep slate colour, and the long plume is glossy dark. It generally builds its nest on a high tree; and as many as eighty nests have been counted on a single oak. Though in the days of falconry, when it was the chief game pursued, it was highly prized for the table, the common heron is now the object of almost universal hostility. Its geographical distribution is wide, extending from Britain to the countries of northern and southern Europe, being most plentiful in Holland, extending into northern Africa, Caucasus, India, Japan, and Java.—The Purple Heron (*A. purpurea*) is a somewhat rare British species.—The Great White Heron or Great Egret (*A. alba*), an extremely beautiful bird with perfectly white plumage, much of it loose and flowing, is an accidental



Common Heron (*Ardea cinerea*).

visitor to Britain. It is more common in Turkey and Greece and in some parts of Asia, where its upper tail coverts are much worn as plumes.—The Little Egret (*A. garzetta*), a smaller copy of the great egret, and frequenting the same localities, is about two feet long, and rather quicker in flight than the larger species.—The Buff-backed Heron (*A. æquinoctialis*) of southern Europe is an insect feeder, and by no means so shy as other species.—America has many species of herons, most numerous in its warmer parts. A common species of the temperate parts is the Green Heron (*A. virescens*), whose flesh is much esteemed. Other important species are the Great Blue Heron (*A. herodias*), the Great White or Florida Heron (*A. occidentalis*), the Great White Egret (*A. egretta*), and the Little White Egret (*A. candidissima*).—The Peacock Heron (*A. helias*) of South America, a small heron of exquisitely graceful shape and mien, with plumage variegated with coloured spots and bars, is a favourite pet-bird of the Brazilians.

Herondas. See HERODAS.

Herophilus, one of the greatest physicians of antiquity, and co-founder of the celebrated medical school of Alexandria, was born at Chalcedon, in Bithynia, and flourished in the 4th and 3d centuries B.C. He distinguished himself in particular by his devotion to anatomy, especially of the brain and those parts which were less known. He was a skilful dissector, and is said to have even dissected criminals alive; moreover, he was a bold and dexterous surgeon. The few fragments of his writings which remain were published at Göttingen in 1840.

Herostratus. See EPHESUS.

Herpes (Gr., from *herpo*, 'I creep'), the name of a group of diseases of the skin, characterised by the presence of clusters of vesicles on an inflamed base. There are two well-defined classes included under the name.

(1) *Catarrhal herpes* occurs most commonly at the edge of the lip, and often attends some febrile disease, especially acute inflammation of the lungs; but may also follow some local irritation, or be without assignable cause. It is attended sometimes by burning or itching sensations, but rarely by pain. The vesicles dry up into a scab, which falls off in the course of a few days. No treatment is generally necessary; but it is very apt to recur. It appears less commonly on other parts of the face, on the mucous membrane of the mouth, and on the genital organs.

(2) *Herpes zoster* (Gr.; Lat. *zona*; Eng. *shingles*, plural of Old Eng. *sengle*, 'a girth,' through Fr. from Lat. *cingulum*, words all meaning 'a girdle') is most commonly met with along the course of one of the intercostal nerves, whence the name. It is now known that the inflammation of the skin depends upon an inflammation of the nerve supplying the area affected, though many forms of inflammation of the nerves occur without producing herpes. Its occurrence can sometimes be traced to a blow, to diseased tissues in the neighbourhood, or to the prolonged administration of arsenic; but more often no cause can be assigned for it. The appearance of the characteristic eruption is generally preceded for some days by neuralgic pain in the affected part; inflammation of the skin in patches, development of vesicles, formation of scabs and their subsequent detachment generally run a pretty uniform course, occupying about a fortnight. In young people nothing is left but slight scarring of the skin; but in those beyond middle life an extremely intractable form of neuralgia often remains, and may persist for months. The disease may occur at any age, but a second attack is quite exceptional. More than one intercostal nerve may be affected at once; but very seldom two on the opposite sides, so that the popular superstition 'that shingles which meet round the body always prove fatal' is not likely to be often practically refuted. Though commonest in connection with the intercostal nerves, herpes zoster may occur on almost any region of the body. The brow is a frequent situation; and if the eye is affected, as sometimes happens, it may be seriously damaged. No treatment seems to be effective in arresting the course of the disease; but painting with flexile collodion, or application of zinc ointment over the inflamed patches, diminishes their irritability.

Herpetology (Gr. *herpĕton*, 'a reptile,' and *logos*, 'a discourse'), that branch of natural history which treats of reptiles. See REPTILES.

Herrera, FERNANDO DE, a Spanish lyric poet, of whom we only know that he was born at Seville in 1534, took orders, and died in 1597. As a poet he ranked so high in the opinion of his contemporaries that they bestowed upon him the appellation of the *divine*. Many of his love-poems are remarkable for tender feeling, while his odes, such as that on the 'Battle of Lepanto,' frequently display a lofty enthusiasm; but his language is very artificial, being full of words, inflections, and inversions in imitation of Greek, Latin, and Italian authors. Many of his poems were accidentally burned shortly after his death; most of what survived were published by Pacheco, the painter, in 1619, and all were printed in the *Coleccion* of Ramon Fernandez (1786; new ed. 1808). Herrera wrote in prose a good *Account of the War in Cyprus* (1572), and translated from the Latin of Stapleton a life of Sir T. More (1592).

Herrera, FRANCISCO, surnamed EL VIEJO (the Elder), Spanish painter, was born in Seville in 1576. His drawing was correct, and his pictorial style is marked by energy, freedom, and boldness, and he became the founder of a school. Herrera's masterpiece was the 'Last Judgment,' in a church at Seville. Besides historical pieces, he also painted such subjects as wine-houses, fairs, carnivals, and the like; he was a clever worker also in bronze. In 1650 he removed to Madrid, and died there in 1656. Some of his best works are in the Louvre at Paris.

His youngest son, FRANCISCO HERRERA, surnamed EL MOZO (the Younger), was born at Seville in 1622. He studied under his father, but to escape his roughness and cruelty ran away to Rome, where he became celebrated for pictures of still life, especially for fish-pieces. Returning to Spain after his father's death, he at first settled in Seville, and was in 1660 appointed sub-director of the academy there; but he soon betook himself to Madrid, where he became painter to the king. His best works are a fresco, 'The Ascension,' in the Atocha church in Madrid, and 'San Francisco,' in Seville cathedral. Herrera died at Madrid in 1685.

Herrera y Tordesillas, ANTONIO, Spanish historian, was born at Cuellar, in Segovia, in 1549, was appointed by Philip II. historiographer of the Indies and of Castile, and died at Madrid, 29th March 1625. His principal work is a *General History of Castilian Exploits in the Pacific* (1601–15), that is, a history of the Spanish-American colonies from 1492 to 1554 (Eng. trans. by John Stevens, 1725). His *Descripcion de las Indias Occidentales* (1601 and 1615) forms an introduction to the above work. He also wrote on the history of England and Scotland in the time of Mary Stuart; histories of Portugal, of the world in the time of Philip II., of the League, and of the Spanish, French, and Venetians in Italy.

Herrick, ROBERT, a great English poet, was born in London, the fourth son and seventh child of a prosperous Cheapside goldsmith of good Leicestershire descent, and was baptised 24th August 1591. His father died the year after, not without suspicion of suicide, and the boy was bound apprentice for ten years to his uncle, afterwards Sir William Herrick, also a well-to-do Cheapside goldsmith. By September 1613, however, we find him a fellow-commoner at St John's College, Cambridge, whence he sent fourteen letters, still extant, to his guardian-uncle, who appears to have been stingy in his allowances of money. The last letter is dated from Trinity Hall, whither he writes he had migrated for economy. Herrick took his M.A. in 1620, and apparently came next to London, where, no doubt, he plunged lightheartedly into the gaieties of the town, as well as 'those lyric feasts made at the Sun, the Dog, the Triple Tun.' He was already a poet, and his 'wild, unbaptisèd rhymes' quickly earned him the friendship of Ben Jonson and his ring of hilarious spirits. In 1629 his mother died, and in the same year he took orders, and was presented to the sequestered living of Dean Prior, near Totnes, in Devonshire. He bemoans his lonely banishment in 'loathèd country life' among 'currish' natives in 'dull Devonshire,' but from his poems we cannot doubt that his keen eye and kindly heart found him a consolation in the observation of the honest country-folk around him whose old-world customs are mirrored so charmingly in his verse. Of his clerical life we know but little, although Wood speaks of his 'florid and witty discourses,' and tells us he was 'beloved by the neighbouring gentry.' He has immortalised his housekeeper, 'Prue' or Prudence

Baldwin, as well as his spaniel 'Tracy,' and a tradition long survived of a 'favourite pig, which he amused himself by teaching to drink out of a tankard.' His 'Julia' is more visionary than these, but no doubt had her existence also. In 1647 the Puritan supremacy ejected him from his vicarage and drove him to London, whence he returned to reassume his duties in August 1662. Here twelve years later he died, being buried 15th October 1674. A monument was placed in the church in 1857.

Herrick's one volume of verse contained the *Hesperides*, dated 1648, and *Noble Numbers*, dated 1647. The last is a collection of professedly religious poetry; the former, an ill-arranged group of lyrical poems addressed to friends and eminent contemporaries, amatory poems, epithalamia, epigrams, fairy poems, and short occasional odes and poems on all kinds of subjects, of which sixty-two had already seen the light in *Wit's Recreations* (1640). The whole embrace more than 1200 poems of lengths varying from five or six pages to a single couplet, many of which are among the most exquisite examples of lyrical art in English. Of these it is enough to name 'Corinna's going a Maying,' 'The Mad Maid's Song,' 'The Night Piece to Julia' ('Her eyes the glow-worm lend thee'), 'To the Virgins' ('Gather ye rose-buds while ye may'), 'To Daffodils,' 'Cherry Ripe,' 'To Anthea' ('Bid me to live'); and, among religious poems, such masterpieces as 'The Litany,' 'The Dirge of Jephthah's Daughter,' and 'A Thanksgiving to God' ('Lord, thou hast given me a cell'). Much of his religious poetry is weak, but these are immortal. Yet the reader turns most often to his secular poems, in almost every line of which he will find a charm of a quite peculiar nature, save only in the epigrams, which are often poor and sometimes gross. The last laureate of fairyland, his 'Fairie Temple,' 'Oberon's Feast,' and 'Oberon's Palace' were not unworthy to follow Shakespeare's *Midsummer Night's Dream* and Drayton's *Nymphidia*.

The *Hesperides* is one of the sunniest books in English literature, consummate in finish, exquisite in fancy, fresh and natural throughout, and rich in sweet and delightful pictures of the homely English country and the quaint, kindly, old-world customs of her folk. His love-poems are stamped with a real *abandon* that is not Horatian and not Anacreontic, but all his own, and ever throughout his joyousness the ear detects an undertone of melancholy. In unforced sweetness of melody and perfect harmony of sound and sense Herrick rises above all his brethren among the Caroline lyrists, and, indeed, follows closely in the steps of Shakespeare. Like the master he is thoroughly natural, unaffected, and English. We do not look for depth and intensity of passion in his work, but within his limits he attains perfection. The fresh fragrance of English meadows lives in his verse, and will beget perpetual delight as long as English literature is read. He sleeps secure of the eternity of fame for which he longed, and which he half-promised to himself.

After being neglected for more than a hundred years Herrick's poems were revived by Mr Nichols (Sylvanus Urban) in the *Gentleman's Magazine* of 1796 and 1797. Editions followed by Dr Nott (1810), T. Maitland (Lord Dundrennan, 1823), W. C. Hazlitt (1869), and Dr Grosart (3 vols. 1876, with an exhaustive memorial-introduction). See F. T. Palgrave's *Chrysomela* (1877), a selection by a fine critic, with a suggestive introduction; and Edmund W. Gosse's essay in *Seventeenth-Century Studies* (1883).

Herring (*Clupea harengus*) belongs to the order of bony fishes (Teleostei) called Physostomi, and characterised by the existence of an open communication between the air-bladder and the gut. The family Clupeidæ is distinguished by the following characters: There is a single short dorsal fin near the middle of the dorsal edge of the body, also a single anal fin. The pelvic fins are abdominal in position, as in all Physostomi. Body covered with thin cycloid scales, head naked, barbels absent. Maxillary bones composed of at least three movable pieces. Branchial apertures very wide. The stomach has a posterior prolongation, which communicates with the air-bladder at its extremity; pyloric appendages numerous. Lateral line usually absent. The genus Clupea, which includes the herring, sprat, pilchard, and shad, is thus defined: Body compressed, with the scales of the ventral edge keeled, each keel projecting posteriorly into a point, so that the edge is serrated. Upper jaw not projecting beyond the lower. Cleft of the mouth of moderate width. Teeth, when present, rudimentary and deciduous. Caudal forked. *C. harengus* is distinguished by having an ovate patch of minute teeth on the vomer; the serrations of the ventral edge are weak; the pelvic fins arise behind the front end of the base of the dorsal. These characters distinguish the herring from the sprat. From the pilchard it is easily distinguished, as that species has much larger scales, and has radiating ridges on the operculum which are absent in the herring. The shad, of which there are two kinds, are much larger, and have opercular ridges like the pilchard. The air-bladder in the herring has an opening to the exterior behind the anus. The herring is a pelagic and gregarious fish, living on the small pelagic organisms, especially Crustacea, which swarm in the sea. The species occurs throughout the German Ocean and the North Atlantic, both on the American and European sides, and also the seas to the north of Asia. Enormous shoals of herring approach the coast every summer in order to spawn, and it is then that the great fisheries are carried on. There are in most places two spawning periods, but the number of those which spawn in winter or spring is always much smaller. The summer spawning season varies in different latitudes. On the east coast of Britain it occurs in June and July at Wick, July and August at Peterhead and Aberdeen, August and September at Yarmouth, September and October off Kent, while on the south coast of England only one spawning period has been observed, namely in January. This corresponds to the winter spawning in the north, which at the mouth of the Firth of Forth takes place in January and February.

The eggs of the herring are small and numerous, and are heavy and adhesive, so that when shed they adhere to the stones, shells, and hydroids, or other material of the sea-bottom. The spawning-ground chosen is always hard, rough, and often rocky, so that it is usually ground which trawls cannot be worked over. The same spawning-grounds are annually visited by the winter-spawning herring. Two such grounds are accurately known—one to the west of the isle of May at the mouth of the Firth of Forth, and one off Ballantrae on the west coast of Scotland, in Ayrshire. None of the summer spawning-beds have been actually discovered, though it is certain that there are acres of them along the east coast of Britain. It is probable that herring remain in Loch Fyne all the year round, and young and half-grown herring are often found in estuaries at various times of the year, ascending as far as the tides extend.

The artificial fertilisation of the herring's ova and their hatching in aquaria are easily effected, and have been carried out several times by various experimenters. But the artificial propagation has never been carried out on a large scale for the sake

of artificially maintaining or increasing the supply of herrings, because it has never yet been proved that the supply has anywhere continuously diminished in consequence of the enormous captures which are annually made. The abundance of the fish at a particular place varies capriciously from year to year, and at different periods of time. On the coast of Bohuslän, in the south of Sweden, multitudes of herring have appeared within the last few years after they had deserted that coast for about seventy years.

Herring-eggs were first hatched under observation by Prof. Allman, in Scotland, in 1862; the eggs in this case were dredged from the bottom off the isle of May. In 1874–78 the eggs were both fertilised and hatched artificially by the German Fishery Commission at Kiel. The development has been described by Kupffer, in 1878, in the annual report of the Kiel Commission. Artificial hatching has also been carried out by the United States Fish Commission. The eggs, when pressed from the fish, are received on glass plates, to which they adhere, and are then developed in a current of pure sea-water. The larva, when hatched, is very slender and elongated: it is perfectly transparent, and at once commences to lead a pelagic existence in the surface waters of the sea. Herring-spawn at the bottom of the sea is largely devoured by flat-fish and haddocks, which are extremely fond of it.

Meyer, of the Kiel Commission, noted the growth of the herring in captivity: when first hatched it is $\frac{1}{4}$th to $\frac{1}{3}$d of an inch long; one month after hatching it is $\frac{2}{3}$ds of an inch; at two months it is $1\frac{1}{4}$ inch; at three months about 2 inches. Then it grows at the rate of about half an inch per month, so that at six months it is about $3\frac{1}{2}$ inches, and at one year $6\frac{1}{2}$ inches. Thus the herring is mature at two years old, but not full-sized. The so-called 'maties,' which are mature fish, and shed spawn and milt, are probably the two-year-old fish spawning for the first time, while the full-grown herring are three or four years old.

For detailed information on the natural history of the herring, see *Nature* (vol. xxvi. p. 607, and vol. xxix. p. 539) and the 'Jahresberichte' of the *Commission zur Untersuchung der Deutschen Meere*, which contain numerous elaborate memoirs on the subject. See FISHERIES.

Herrings, BATTLE OF. See FASTOLF.

Herrnhut, a small town in the kingdom of Saxony, 18 miles SE. of Bautzen, celebrated as a chief seat of the Moravian Brethren (q.v.) or Herrnhuters, who settled here in 1722. Pop. 1125.

Herschel, SIR WILLIAM, born at Hanover, November 15, 1738, was the son of a band-master, and was educated as a professional musician. He first visited England as a member of the band of the Hanoverian Guards; but in 1757 he established himself in England, becoming a teacher of music in the town of Leeds, whence he went to Halifax as organist, and subsequently (1766) in the same capacity to Bath. Here he would seem to have first turned his attention to astronomy. Wanting a superior telescope, and unable to afford to buy a good reflector, he made one for himself—a Newtonian, of 5 feet focal length, and with this applied himself to study the heavens. In 1781 he made his first discovery, being a new planet, which at first he took for a comet. It was detected by an exhaustive process of surveying the heavens, which Herschel was the first to follow, taking the stars in regular series, and examining them all in their groups through the same instrument. The result of his discovery was his appointment to be private astronomer to George III., with a salary of £200 (afterwards £250) a year. He then went to live at Slough, near Windsor, where, assisted by his sister Caroline, he continued his researches. Herschel married a Mrs Mary Pitt, and left one son, John. He was knighted by George III., and made a D.C.L. by the university of Oxford; he became rich partly through his wife's jointure, and partly through selling mirrors for reflecting telescopes. He died at Slough, 25th August 1822.

Herschel contributed sixty-nine papers to the *Philos. Trans.* between the years 1780 and 1815; and to the first vol. of *Mem. of the Astron. Society* he contributed a paper 'On the Places of 145 New Double Stars.' He greatly added to our knowledge of the solar system: he discovered Uranus (called by him Georgium Sidus) and what he took for its six satellites, and two satellites of Saturn. Besides this he detected the rotation of Saturn's ring, the period of rotation of Saturn itself and that of Venus, the existence of the motions of binary stars, the first revelation of systems besides our own. He extended our knowledge of the Milky Way and the constitution of nebulæ, and, in fact, was the first to give the human mind any conception of the immensity of the universe. His catalogue of double stars, nebulæ, &c., and tables of the comparative brightness of stars, and his researches in regard to light and heat would of themselves entitle him to the first rank as an astronomer and natural philosopher. He erected a famous monster telescope of 40 feet length. It was begun 1785, and finished 1789, in which year he by means of it detected the sixth satellite of Saturn. See Herschel's *Life and Works*, by E. S. Holden (New York, 1881).

His sister, CAROLINE LUCRETIA, was born 16th March 1750, and lived in Hanover till 1772, when she came to England to live with her brother at Bath. When William turned astronomer she became his constant helper; and on his being appointed private astronomer to George III. she acted as his assistant, doing all the duties of an assistant-astronomer, and in that character receiving a small salary from the king. While discharging her duties in this position she found time for a series of independent observations with a small Newtonian telescope, made for her by her brother. Her special business was to sweep the heavens for comets, eight of which she discovered, in regard to five of which she has the credit of priority of discovery; and several remarkable nebulæ and clusters of stars included in William's catalogues were described from her original observations. In 1798 she published, at the expense of the Royal Society, *A Catalogue of Stars taken from Mr Flamsteed's Observations*, which contained 561 stars omitted in the British catalogue. She lived with her brother during the whole of his career, sharing his labours and distinctions, and on his death returned to her native country. She was then seventy-two years of age, but she lived to be ninety-eight, retaining all her faculties to the last. In 1828 the Astronomical Society conferred on her their gold medal, and she was an honorary member of the society. She died 9th January 1848. See her *Memoir and Correspondence*, edited by Mrs Herschel (1876).

SIR JOHN FREDERICK WILLIAM HERSCHEL, the only son of Sir William, was born at Slough, 7th March 1792, and educated at Eton and St John's, Cambridge, where, in 1813, he was senior wrangler and first Smith's prizeman. His first publication was *A Collection of Examples of the Application of the Calculus of Finite Differences* (1820). In 1822 he applied himself especially to astronomy, using his father's methods and instruments in observing the heavens. For a time he worked with Sir James South in re-examining the nebulæ and clusters of stars described in his father's catalogues. The results of the re-examination were given in

1833 to the Royal Society in the form of a catalogue of stars in order of their right ascension. The catalogue contained observations on 525 nebulæ and clusters of stars not noticed by his father, and on a great number of double stars—in all between 3000 and 4000. This important contribution to science led to his being acknowledged as the worthy successor of his father; so early, indeed, as 1826 the Royal Society had voted to him and South a gold medal apiece for their observations on double stars; but by 1833 his pre-eminence was beyond the necessity of being marked by acknowledgments. His treatises on Sound and on the Theory of Light had appeared in the *Encyclopædia Metropolitana* (1830–31); his treatise on Astronomy (1831) and the 'Preliminary Discourse on the Study of Natural Philosophy' in Lardner's *Cyclopædia*; not to mention his papers in the *Transactions of the Astronomical Society*. In January 1834 Herschel arrived at the Cape of Good Hope, with the intention of completing the survey of the sidereal heavens, by examining the southern hemisphere as he had done the northern. Here he established his observatory at Feldhausen, six miles from Table Bay; and in four years, working all the time at his own expense, he completed his observations. The public interest taken in his labours was, as might be supposed, very great; but though now and then gratified by partial statements of his results, it was not till 1847, nine years after his return from the Cape, that it received full gratification in the publication of a volume of *Astronomical Observations made at the Cape; being the Completion of a Telescopic Survey of the whole Surface of the Visible Heavens commenced in 1825*. It need not be said that the results of these labours are invaluable. They are now incorporated into all books on astronomy. Herschel, when at the Cape, gave an impulse to the science of meteorology, having the merit of having suggested the scheme for taking meteorological observations simultaneously at different places.

On his return to England honours were showered on him—he was made D.C.L. of Oxford, and, on the Queen's coronation, a baronet. He was president of the Astronomical Society, and in 1849 became Master of the Mint. His articles on Meteorology, Physical Geography, and Telescope, contributed to the *Encyclopædia Britannica*, were published separately; and his *Popular Lectures on Scientific Subjects* (new ed. 1880) and *Collected Addresses* are well-known works. Herschel was also a distinguished chemist, and attained important results in photography independent of Fox Talbot. His researches on the undulatory theory of light were very valuable. He had also a profound interest in poetry, and made translations from Schiller and from the *Iliad*. He died at Collingwood, in Kent, on 12th (not 11th) May 1871, and was buried in Westminster Abbey near Sir Isaac Newton. See Agnes M. Clerke, *The Herschels and Modern Astronomy* (1896).

Herschel, or URANUS. See PLANET.

Hersfeld, an old town of Hesse-Nassau, on the river Fulda, which here becomes navigable, 27 miles N. of Fulda by rail. Here are a fine Gothic church, built in 1320; the ruins of the cathedral, destroyed by the French in 1761; and the formerly-celebrated Benedictine abbey, founded in 769. Pop. 7271.

Hership, an old Scotch law term, denoting the offence of carrying off cattle by force.

Hertford, the county town of Hertfordshire, 26 miles N. of London by rail, is situated on the Lea, which is navigable for barges up to this point. It contains few buildings of any architectural importance, save one ancient church; but there are also a town or shire hall (1768), an infirmary, and a corn exchange and free library (1859). Hertford has a grammar-school and several charity schools, whilst at the entrance into the town on the London Road is a preparatory school in connection with Christ's Hospital (q.v.) in London. A considerable trade is carried on in corn, malt, and flour. Hertford returned two members to parliament till 1867, and in 1885 ceased to be a parliamentary borough. Pop. (1851) 6605; (1881) 7747; (1891) 7232. The New River (q.v.) has its source a mile east of the town, and 2 miles westward is Panshanger, the seat of Earl Cowper, with its valuable collection of pictures. Of the old castle of Hertford, commenced by Edward the Elder about 905 to protect the inhabitants from the incursions of the Danes, and strengthened by William the Conqueror, but a small portion now remains; the present castle was built by William Cecil, Earl of Salisbury, or Sir William Harrington, in the reign of James I., and in 1805–9 was occupied by the East India Company as a temporary college during the erection of Haileybury (q.v.). See Turner's *History of Hertford* (1830).

Hertfordshire, or HERTS, an inland county of England, extending 35 miles in a north-easterly direction and 20 miles in mean breadth, is bounded N. by Cambridge, E. by Essex, S. by Middlesex, and W. by Buckingham. It contains 611 sq. m., of which more than one-half is under tillage, one-fourth pasture, and one-seventeenth in wood; is divided into 8 hundreds, 2 municipal boroughs—viz. Hertford and St Albans—138 parishes, and has 11 market-towns, the chief of which are Hertford (the county town), St Albans, Watford, Hitchin, Hemel Hempstead, and Bishop-Stortford. Pop. (1801) 97,577; (1841) 156,660; (1881) 203,140; (1891) 220,125. The surface is mostly level, except in the north, where a branch of the Chiltern Hills skirts the county, Kensworth Hill (904 feet) being the highest elevation. The principal rivers are the Lea, the Stort, and the Colne, all affluents of the Thames, and the artificial stream called the New River (q.v.): the Grand Junction Canal, too, passes through the south-western extremity of the county. Chalk, at a greater or less depth below the surface, forms the basis of the soil, which is various, but principally loam and clay, the former being met with in nearly all its gradations, more or less intermingled with flint or sand. The climate is mild and healthy. As a manufacturing county Herts does not stand high. Straw-plaiting is, however, largely carried on in the north and west portions, where the land is least adapted for agriculture; in the neighbourhood of Watford and Rickmansworth are several paper and silk factories, and at Great Berkhampstead are extensive chemical works. The agriculture of the county has improved very much of late years, the quantity of barley and wheat grown being very considerable; immense quantities of hay, too, are sold off the land, and sent to London. Ware is the chief seat of the malting trade in the kingdom; Cheshunt, Waltham Cross, and Bishop-Stortford are famous for their rose-gardens, and in some districts watercress is extensively cultivated for the London market. Herts is almost entirely in the diocese of St Albans and in the South-eastern Circuit, and since 1885 has returned one member to parliament for each of its four divisions—North or Hitchin, East or Hertford, Mid or St Albans, and West or Watford. Many historical events are connected with the county: it was the scene, at Verulam near the present town of St Albans (q.v.), of contests with the Romans, and of the martyrdom of St Alban; in it, too, were fought three of the most important battles in England's history—the first in 1455,

when Henry VI. was wounded and taken prisoner at St Albans by the Yorkists; again at St Albans six years later, when victory decided for the opposite party; and lastly in 1471, at Barnet, when the decisive battle was fought, in which the Lancastrians were utterly routed by the Yorkists. Rye House was the residence of Rumbold, one of the persons engaged in the alleged plot against the life of Charles II. Kings Langley, Hunsdon House, and Hatfield were royal residences, and at Theobalds James I. ended his days. Amongst the worthies of Herts mention may be made of Nicholas Brakespeare, afterwards Pope Adrian IV.; Francis Bacon, afterwards created Lord Verulam; Richard Gough, the antiquary; the poet Cowper; Bulwer Lytton; Charles Lamb; and John Leech. Hertford gave a title to a branch of the family of Seymour (q.v.; and see EDWARD VI.). See Cussan's *History of Herts* (1880).

Hertha (true reading in Tacitus, *Nerthus*), the North German deity identified with 'Mother Earth,' to whom the Hertha Lake in Rugen was sacred.

Hertogenbosch. See BOIS-LE-DUC.

Hertz, HEINRICH, physicist, was born 22d February 1857, at Hamburg, and studied at Berlin, where in 1880 he became assistant to Helmholtz. In 1883 he began to lecture in Kiel, in 1885 was called to the technical school at Karlsruhe, and in 1889 succeeded Clausius at Bonn. He greatly advanced the science of electricity, was the continuator of the work of Faraday and Clerk-Maxwell, and was a singularly ingenious experimenter. He died 1st January 1894. In the three volumes of his collected works (1894) the most important discussions are those on the relation of light and electricity, on the diffusion of electric force, and on the principles of mechanics. See the *éloge* by Planck (1894), and Lodge in *Nature* for June 1894.

Hertz, HENRIK, Danish poet, was born of Jewish parents in Copenhagen, 25th August 1798, and studied for the bar. *Gjengangerbrevene* ('Letters of a Ghost'), a rhymed satirical poem, created a sensation in 1830. His finest dramatic writings are *Svend Dyring's Huus* (1837), a romantic drama; and *Kong René's Datter* (1845), a lyric drama (translated four times into English—in 1850 by Sir Theodore Martin). He also wrote many lyrics (4 vols. 1857–62), a lyrical comedy, and a humorous novel. He died 25th February 1870.

Hervé, whose proper name was FLORIMOND RONGER, a musical composer, was born on 30th June 1825, at Houdain, near Arras. In 1848 he made his first appearance in an operetta composed by himself, *Don Quichotte et Sancho Panza*. Then, after officiating for three years as director of the orchestra at the theatre of the Palais Royal, he worked as singer, composer, director, and actor in various theatres. Some of his light operas have had very successful runs, such as *L'Œil Crevé*, *Chilpéric*, and *Le Petit Faust*. He died November 4, 1892.

Hervey, JAMES, author of *Meditations among the Tombs*, was born at Hardingstone, near Northampton, on 26th February 1714. The facts of his life are few. He was educated at Northampton and Lincoln College, Oxford, and was first curate and afterwards incumbent of Weston-Favel and Collingtree, both near Northampton. He died on Christmas-day 1758. Hervey adopted a Calvinistic creed, and in the 18th century his works, though not distinguished by any extraordinary qualities, enjoyed great favour with the people. The best of them are *Meditations and Contemplations* (1746), including his most famous production, 'Meditations among the Tombs,' and also 'Reflections on a Flower Garden' and 'A Descant on Creation;' *Contemplations on the Night and Starry Heavens* (1747); and *Theron and Aspasio, or a Series of Dialogues and Letters on the Most Important Subjects* (3 vols. 1755). This last gave rise to the Sandemanian controversy as to the nature of saving faith. A complete edition of his works, with a memoir, appeared in 1797. See also his Life and Letters (2 vols. 1760).

Hervey Islands. See COOK ISLANDS.

Herwarth von Bittenfeld, KARL EBERHARD, Prussian general, was born in 1796, and gained his first laurels in the war of liberation, especially in the battle of Leipzig. In 1864, raised to the rank of general, he acquired great fame through his daring capture of the isle of Alsen. In the campaign of 1866 he was entrusted with the occupation of Saxony, and then with the command of the army which advanced from Saxony into Bohemia. He contributed largely to the brilliant victories of Hühnerwasser, Münchengrätz, and Königgrätz. In 1870, on the outbreak of the Franco-German war, he was made governor of the Rhine provinces, in 1871 a general field-marshal; and he died at Bonn, 2d September 1884. In the war of 1866 one of his sons fell; in that of 1870 two were killed.

Herz, HENRI, a pianist and composer for the pianoforte, was born of Jewish parentage at Vienna in 1806, and educated principally in Paris, where his talent was early recognised. His compositions became popular over Europe, and he was received with great applause on visiting England in 1834, and America in 1846. In 1837 he received the decoration of the Legion of Honour; and from 1842 till 1874 he was professor of Music at the Conservatoire of Paris. At the same time he managed a pianoforte factory, and in 1855 gained with his pianofortes the first prize at the Paris exhibition. His compositions, more than 200 in number, are mostly for the piano, and are characterised by melodic charm and a certain originality. He died 5th January 1888.

Herz, HENRIETTE, a lady of great beauty, high intelligence, and wide culture, and a Jewess, who, in the beginning of the 19th century, made her home at Berlin a gathering-place for the intellectual life of the city. Amongst those who either met in her salon or were in correspondence with her were the Humboldts, Fr. Schlegel, Gentz, Varnhagen von Ense, Rahel, Schleiermacher, and Börne. She was born at Berlin, on 5th September 1764, the daughter of a Jewish doctor of Portuguese origin, Benjamin de Lemos, and was married in 1779 to another doctor, Markus Herz. In 1817 she went over to Protestantism. She died on 22d October 1847. See her Life by Fürst (2d ed. 1858), and her correspondence with Börne (1861).

Herzegovina. See BOSNIA.

Herzen, ALEXANDER, a Russian author, was born at Moscow, 25th March 1812. In 1834, while yet a student, he was imprisoned for his political opinions. From 1842 he published much, principally novels and political works. In 1846 he left Russia, and eventually established himself in 1851 in London. At this time his voice had great weight in influencing public opinion in Russia, chiefly by means of his paper *Kolokol*, of which thousands of copies were smuggled into Russia, in spite of the government prohibition. But Herzen gradually lost his influence as he became more and more a party-man, and especially by his advocacy of the cause of the Poles at the outbreak of their rebellion in 1863. He died at Paris, 21st January 1870. Of his numerous works may be mentioned the novels *Who is to Blame?* and *Dr Krupoff*, and *From the Other Shore*, *Letters*

from Italy and France, Development of Revolutionary Ideas in Russia, Baptised Property (Serfdom), and *The Social Condition of Russia*. Many of these appeared under the pseudonym of Iskander. He also edited *Memoires de l'Impératrice Cathérine* (1859), and the works of Pushkin, Lermontoff, &c. His collected works appeared in Russian in 11 vols. at Basel, 1875 *et seq.*

Herzog, JOHANN JAKOB, a theologian of the Reformed creed, was born at Basel, 12th September 1805, and, after studying at Berlin, became professor at Lausanne (1830), Halle (1847), and Erlangen (1854). He died 30th September 1882. Amongst his works are a book on the Plymouth Brethren (Lausanne, 1845), lives of Calvin and Œcolampadius, a work on the Waldenses, and a church-history; but his name is best known for the great theological encyclopædia edited by him, *Realencyklopadie fur Protestantische Theologie und Kirche* (22 vols. Gotha, 1854-68); new ed. by Herzog, Plitt, and Hauck (18 vols. 1877-88); English abridged ed. by Schaff (3 vols. 1882-84).

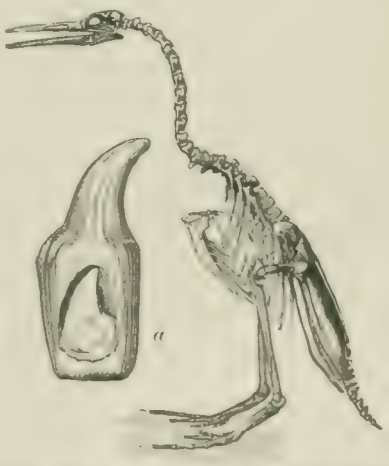
Hesiod, the earliest didactic poet of Greece of whom we have any knowledge, was born in Ascra, a small village at the foot of Mount Helicon. As he himself informs us, in his boyhood he tended flocks on the mountain. On the death of his father he became engaged with his brother, Perses, in a lawsuit as to the division of their patrimony. His brother bribed the 'kings' or judges, and thus gained unjust possession of the property, which, however, he soon dissipated. But Hesiod prospered, and when Perses in his poverty applied to him for aid Hesiod gave him the good advice which forms the larger part of his *Works and Days*. According to a passage (if genuine, 646-662) in the same poem, Hesiod attended the funeral games of Amphidamas at Chalcis, in Eubœa, and there recited a hymn of his composition which gained him the prize. It was probably for some such festival that he composed the *Theogony*. Where or how Hesiod died we do not know. The only data we possess for fixing the time at which Hesiod lived are those contained in his works, for although Herodotus makes Hesiod contemporary with Homer, he can have had no sufficient evidence to go upon. The poems of Hesiod show acquaintance with a wider geographical horizon, especially westwards, than do those of Homer; the language is in a later stage, the digamma more frequently neglected; and, finally, in Hesiod there are unmistakable imitations of Homer. We may therefore safely conclude that Hesiod was later than Homer —possibly belongs to the end of the 8th century B.C.

The *Works and Days* is generally considered to consist of two originally distinct poems, one containing the good advice to his brother, preaching up honest labour and denouncing corrupt and unjust judges; the other, the real *Works and Days*, containing advice as to the days lucky or unlucky, proper or improper, for the farmer's work. The *Theogony* teaches the origin of the universe out of Chaos, the creation of earth and hell, of night and day, sea and sky, sun and moon, and the history of the gods. Bœotian tradition denied that the *Theogony* was the work of Hesiod, but Herodotus affirms it (ii. 53), and the internal testimony and the similarity of the language of the *Theogony* and the *Works and Days* confirms Herodotus. On the other hand, the *Shield of Heracles*, which has been preserved, and the *Catalogue of Women* and the *Eoœ*, which have not, were not genuine. The corrosive criticism which has been poured on the Homeric poems has also been applied to the Hesiodic; and here too the critics are not agreed whether the unity of the poems is the work of the original composer, and has been disturbed by interpolations, or is the work of some late editor harmonising lays originally unconnected. The dialect (Old Ionic) in which the Hesiodic poems are composed has also been attacked. Fick maintains that the *Theogony* was composed in the Delphic dialect, the *Works and Days* in ancient Æolic, and that they were subsequently rewritten in artificial Ionic.

Hesiod wrote not to please the imagination, but to improve the mind. Homer told tales, the tale of Troy, of Achilles, of Odysseus, 'lies like unto the truth,' as Hesiod would say. Hesiod's object was to tell the truth. His poetry is not very poetical, but it has its interest. In the first place, it is what the Greeks learned by heart as children and quoted as men for their moral guidance. In the next place, the *Works and Days* gives us an invaluable picture of the village-community as it existed in Greece in the 8th century B.C., and of the 'kings' of Homer as they appeared to the villagers. Finally, the *Theogony* is of the utmost importance to the comparative mythologist. The first edition of Hesiod appeared at Milan, 1493; other editions, Schömann (1869), Fick (1887). See also Gruppe, *Die griech. Kulte u. Mythen*, i. 567-612.

Hesperides, the name of the sisters who, assisted by the dragon Ladon, guarded the golden apples which Hera had received, on her marriage with Zeus, from Gæa. Their genealogy and their number are variously given by mythologists. The gardens of the Hesperides were placed far in the west, on the verge of the ocean, or in the land of the Hyperboreans. The apples were stolen by Hercules (q.v.), but were afterwards restored by Athena. See ATLANTIS.

Hesperornis, a remarkable extinct form of bird, the remains of which have been met with in the American Cretaceous deposits. As described by Professor Marsh, it possessed small pointed reptilian teeth, which were implanted in a deep



Restoration of Skeleton of *Hesperornis regalis*: *a*, tooth of do. with germ of second teeth (magnified).

continuous groove, somewhat like those of Ichthyosaurus. Its brain was small and more reptilian in type than that of any adult bird as yet examined. It appears to have been a large diving-bird, measuring over 5 feet from the point of the bill to the end of the toes. Its wings were rudimentary, its legs powerful, and its feet well adapted for rapid progression in water. The tail was broad, could move up and down, and was probably used as a rudder or swimming-paddle. The long slender jaws were united in front only by cartilage, as in serpents, and had on each side a joint which admitted of

some motion, so that 'the power of swallowing was doubtless equal to almost any emergency.' See ODONTORNITHES.

Hesperus, the Greek name (Lat. *Vesper*) for Venus as the evening star (see PLANET). Hence the Alexandrian grammarians called Italy, and sometimes all western Europe, *Hesperia*, 'the western land.'

Hesse (Ger. *Hessen*), or HESSE DARMSTADT, a grand-duchy of the German empire, lying between 7° 51′ and 9° 39′ E. long., and 49° 24′ and 50° 50′ N. lat. A strip of Hesse-Nassau divides it into a northern part, Oberhessen, completely enclosed by Prussia, and a southern part, comprising the two provinces of Starkenburg, east of the Rhine, and Rheinhessen, west of the Rhine. Besides these two main parts there are eleven enclaves in Baden and Prussia, the largest Wimpfen and Hohenstadt. Oberhessen is partly occupied in the east by the Vogelsberg, culminating in Taufstein (2532 feet), in the south-west by a ramification of the Taunus, the fertile and undulating valley of Wetterau lying between them. Starkenburg, in the south-east, is covered by the larger part of the Odenwald. The Bergstrasse divides the uplands of Starkenburg on the east from the plain of the Rhine on the west. This plain merges in the north into the plain of the Main. Rheinhessen, fertile and populous uplands, laid out largely in vineyards, the principal industry of the province, lies between the three points, Kreuznach, Mainz, and Worms. With the exception of the streams to the east of Vogelsberg draining into the Fulda, the waters of Hesse belong to the Rhine system. Rhine, Main, Neckar, and Lahn Of the total surface, comprising 3000 sq. m., 50 per cent. is tilled land and garden, and 31 forest. The most important products are corn—particularly in the Rhine and Main plains, and in Wetterau—pulse, potatoes, rape, poppy, tobacco, flax, fruit, and vines. Hesse yields iron, manganese ore, and peat. The industries—mainly in Mainz, Offenbach, and Worms—include the making of leather, boots, upholstery, tobacco, cigars, chemicals, &c. For an old Hessian trade, see MERCENARIES.

The total population amounted in 1875 to 882,349, in 1885 to 956,611, in 1890 to 992,883. Of these 419,642 belonged to Starkenburg, and 666,118 were Protestants, 293,632 Catholics, and 25,331 Jews. Mainz (q.v.) is the largest town; Darmstadt is the capital. Hesse has a university at Giessen, with 550 students, and a technical university at Darmstadt, with 300 students.—The government is constitutional, the legislative power consisting of two chambers. The annual revenue for the period 1894–97 was estimated at £1,721,000, and the expenditure at £1,570,000.

The Hessen were an ancient German tribe, and their territory came to be included in the principality of Thuringia. We first hear of the landgrave of Hesse in the 13th century. On the death of Philip the Magnanimous in 1567 the landgraviate of Hesse was quartered among his four sons, into Cassel, Marburg, Rheinfels, and Darmstadt. The House of Rheinfels becoming extinct in 1583, and that of Marburg in 1604, Hesse was reconstituted in two divisions—Hesse-Cassel and Hesse-Darmstadt. After the French Revolution Louis X., under pressure of France, signed a treaty of neutrality, and (1805–13) supplied Napoleon with a contingent of troops against the other Germans. In 1806 Louis assumed the title of grand-duke. In 1813, after the battle of Leipzig, Louis joined the allies, and in 1815 had to acknowledge the independence of Hesse-Homburg. In 1866 Hesse, having sided with Austria, had to yield up certain territories, including Hesse-Homburg, recently acquired, to Prussia. In 1820 was founded a new constitution of government, modified in 1856, 1862, and 1872.

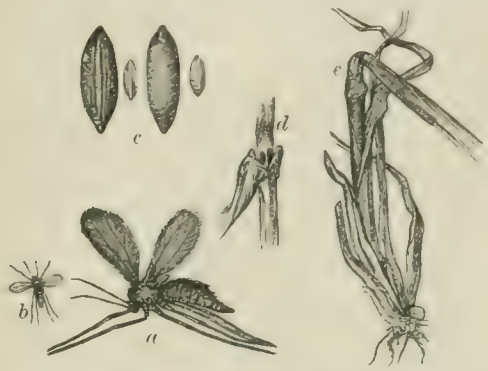
Hesse-Cassel, till 1866 a German electorate, now forming the government district of Cassel in the Prussian province of Hesse-Nassau (q.v.). Area, 3700 sq. m.; pop. (1864) 745,063. The landgraviate of Hesse-Cassel was formed by William IV., eldest son of Philip the Magnanimous, who died in 1567. Constituted an electorate in 1803, it was occupied by the French in 1806, incorporated with Westphalia in 1807, and reconstituted an electorate in 1813. The elector having joined Austria in 1866, Hesse-Cassel was incorporated with Prussia, as part of the province of Hesse-Nassau.

Hesse-Homburg, till 1866 a landgraviate of Germany, consisting of the lordship of Homburg vor der Höhe, on the right bank of the Rhine, and the lordship of Meisenheim, on the left bank. Area, 106 sq. m.; pop. (1864) 27,374. Since 1866 Hesse-Homburg has been incorporated with Prussia, Homburg now forming part of the district of Hesse-Cassel, and Meisenheim of that of Coblenz. Hesse-Homburg was constituted a landgraviate in 1596. In 1806 Hesse-Homburg became again incorporated with Hesse-Darmstadt, but in 1815 was decreed independent, while it was enlarged by the addition of the district of Meisenheim. In 1866 Hesse-Homburg reverted to Hesse-Darmstadt; but the grand-duke, having espoused the cause of Austria in the seven weeks' war, was forced to surrender Hesse-Homburg to Prussia.

Hesse-Nassau, a province of Prussia, between Bavaria and Saxony on the east and the Rhine on the west, was formed (1867–68) out of parts of the former electorate of Hesse-Cassel, of the former Duchy of Nassau, of the lordship of Homburg forming part of the former countship of Hesse Homburg, of the larger part of the former free town of Frankfort-on-the-Main, and small parts of Bavaria. It comprises 5943 sq. m. The surface consists mostly of uplands, contrasting with the Main plain and part of Wetterau in the south, and with the narrow valleys of the Werra and Fulda, and the fertile basin of the Schwalm in the north. The hills covering its surface include the Taunus and the Westerwald, rising to 2886 feet; the Hohe Rhön, rising in Grosse Wasserkuppe to 3096 feet; the Lahn Mountains, &c. The Thüringerwald traversing Schmalkalden culminates in the Inselsberg (3001). Among the minerals are iron, copper, lead, manganese, and building-stone. It is rich in mineral waters, such as at Wiesbaden, Ems, Kronthal, Homburg, &c. The manufactures include gold and silver wares at Cassel, leather at Eschwege, damasks and other stuffs at Fulda, iron-foundries at Hanau, &c. The population in 1875 was 1,467,898; in 1890, 1,664,426; 1,156,457 being Protestants, 455,332 Catholics, and 44,543 Jews. Of its 108 towns only seven (Frankfort, Cassel, Wiesbaden, Hanau, Bockenheim, Marburg, and Fulda) have more than 10,000 inhabitants each. Hesse-Nassau has a university at Marburg, twelve gymnasiums, thirty-eight 'Real-,' commercial, and higher schools, seven teachers' seminaries, three deaf and dumb and two blind institutes. The principal occupations are agriculture, cattle-rearing, the usual industries, and mining.

Hessian Fly (*Cecidomyia destructor*), a dipterous insect, which in its larval state is one of the most important crop-pests, attacking stems of barley, wheat, and rye. The eggs are usually laid on the leaves twice a year, in May and September, and the larvæ, which hatch in a fortnight, bore into the stem, suck the juices, and destroy the plant. The larvæ turn to pupæ in the end of July,

or in spring, and thence the flies develop in about ten days. The egg is very minute, about $\frac{1}{50}$th of an inch, and pale red towards hatching. The larva or maggot has a shining, oval body, white or yellowish, with a soft fleshy head and twelve segments.



Hessian Fly (*Cecidomyia destructor*):
a, magnified; *b*, natural size; *c*, pupa cases ('flax-seeds') in different stages, natural size and magnified; *d*, barley stem, showing 'flax-seeds' *in situ*; *e*, stem elbowed down. (From Miss Ormerod.)

The mouth parts are very delicate, but near the hind end is a chitinous 'anchor process,' which is probably used as a digger or scraper. The pupa-cases, which are called 'flax-seeds,' are about $\frac{1}{8}$th of an inch in length, of a long oval shape, and of a brownish or chestnut colour. The fly itself is a little stout-made black and brown gnat, about $\frac{1}{4}$th of an inch in length.

The fly was first known as a scourge in North America during the years 1786 and 1789, and owes its name to the erroneous supposition that it was imported by the Hessian troops, mercenaries of Great Britain. In England it appeared in 1788, and was described by Sir Joseph Banks. 'It is now known to exist in the south of France, Austria, Hungary, and southern Russia, and its original habitat is considered most probably to have been southern Europe and western Asia.' In 1886 it occurred in Britain, and in some districts is said to have caused a loss of several bushels per acre. In some years the loss in America has been enormous; as in the years 1790, 1821, 1844–45, 1871–72, 1876–78. Late sowing, 'ploughing in' infested stubble, the use of 'bait' patches of corn, rotation of crops, the selection of strong-stemmed corn, and the like are suggested preventions of the scourge.

See CECIDOMYIA, CORN INSECTS; E. A. Ormerod, *The Hessian Fly* (Lond. 1886); A. S. Packard, 'The Hessian Fly, its ravages, &c.' in *U.S.A. Third Rep. of Entomolog. Comm.* (Washington, 1883); H. A. Hagen, 'The Hessian Fly not imported from Europe,' in *Canad. Entomologist* (1880); B. Wagner, *Die neue Getreide Gall-Mucke* (1861).

Hesychasts (Gr. *hēsychazein*, 'to be quiet'), a mystic and contemplative sect of the Greek Church in the 14th century, who may be described as the Quietists of the East. A Basilian monk, named Barlaam, a native of Calabria, in the course of a visit to the monasteries of Greece, observed among the monks of Mount Athos several practices and doctrines which he considered grievously reprehensible, but one in especial. Believing that in the soul lay hidden a certain divine light, which it was the office of contemplation to evoke, the monks withdrew at stated times to a retired place, seated themselves on the earth, and fixed their eyes steadfastly on the centre of the stomach (whence the soubriquet by which they were known, *omphalopsychoi*, 'navel souls'); and they averred that, after the allotted time of contemplation, a kind of heavenly light beamed forth upon them from the soul (whose seat, they held, was in that region), and filled them with ecstasy and supernatural delight. The monks were defended by Gregory Palamas, the Archbishop of Thessalonica; and councils in 1341 and 1351 pronounced in their favour. But the public voice was hostile to the sect, and they soon fell into obscurity. See Stein's monograph (Vienna, 1874).

Hesychius, a Greek grammarian of Alexandria, flourished probably towards the end of the 4th century A.D. He was the author of a Greek lexicon, containing words and phrases, obscure, rare, and dialectical, which, in spite of the corruption of the text, is one of the most useful books we have for understanding the works of the great classic writers of Greece. The best edition is that published by Alberti and Ruhnken (1746–66; with additions by Schow, 1792).—HESYCHIUS of Miletus wrote a work on eminent Greek writers, and a universal history (mostly lost) down to 518 A.D. See Orelli's edition (1820).

Hetairai, or HETÆRÆ (Gr., 'female companions'), the courtesans of Athens, who enjoyed a social standing not elsewhere accorded to them, were often women of high culture, and exercised great influence. See ASPASIA, LAIS, PHRYNE.

Hetairists. See YPSILANTI.

Heterocercal (Gr. *hetĕros*, 'unequal,' and *kerkos*, 'tail'), Agassiz' term for the tail of Elasmobranch and most Ganoid fishes, in which the vertebral axis is bent upwards in the tail, making the upper lobe much the larger (see the article STURGEON). In bony fishes also the axis is somewhat bent upwards in its termination, but the asymmetry is disguised, and the tail looks equal-lobed or *homocercal*. In some Teleosteans and Ganoids, in a few Elasmobranchs, and in Dipnoi, the tail is genuinely symmetrical or *diphycercal*.

Heteropoda, pelagic Gasteropods, in which the 'foot' has become a swimming organ. In association with their active life on the surface of the ocean must be noted not only the locomotor foot, but the protective transparency, the highly-developed nervous system and sensory structures, eyes, ears, and smelling organ. The toothed ribbon in the mouth is also very elaborate. Technically the Heteropods are included among the Azygobranchs. Atlanta, with a large visceral dome and shell; Carinaria, with a reduced hump and small cap-like shell; and Pterotrachea, without a hump or shell, are the three types. See GASTEROPODA, MOLLUSCS.

Heteroptera. See HEMIPTERA, WATER-BUG.

Hetman, or ATAMAN, the title of the head or general of the Cossacks (q.v.).

Hevelius (whose real name was HOVEL or HOVELKE), JOHANN, German astronomer, was born at Danzig, 28th January 1611, and died in that city, 28th January 1687. He was wealthy, and in 1641 he erected an observatory in his own house, and for forty years carried on astronomical observations therefrom. He wrote descriptions of the phases and spots of the moon, conducted numerous researches on comets, and prepared charts of the moon and of the heavens. He laid down the results of his observations in *Selenographia* (1647), *Cometographia* (1668), and *Machina Cœlestis* (1673; reprinted, with an English trans. by Prince, in 1882), besides minor works.

Heves, a town of Hungary, 60 miles ENE. of Pesth. Pop. 6698.

Hexachord, in modern music, denotes the six diatonic degrees of which Guido formed his scale. See GUIDO, and SCALE.

Hexagon (Gr. *hex*, 'six,' and *gonia*, 'angle'), a figure of six sides and six angles; when the sides and angles are equal it is called a *regular hexagon*. Of the three figures which can completely occupy space (the equilateral triangle, square, and hexagon) the hexagon contains the greatest area within a given perimeter, the proportions between the three different figures being nearly as the numbers 4, 5, 6. It is thus that bees, by making their cells of a hexagonal form, enclose the greatest space with the least expenditure of wax. See BEES.

Hexahedron, a solid figure bounded by six faces—the cube being one inch.

Hexameter, the name applied to the most important form of classical verse. It is the heroic or epic verse of the Greeks and Romans, the grandest examples of which are the *Iliad* and *Odyssey* in Greek, and the *Æneid* in Latin. It consists, as its name implies, of six feet or measures, the last of which must be a spondee (a measure composed of two long syllables), and the penultimate a dactyl (one long syllable and two short). If the penultimate is also a spondee, the verse is said to be spondaic. Klopstock, Goethe, and Voss have produced admirable specimens of hexameter verse in German; and it has become familiar in English through Longfellow's *Evangeline*, Kingsley's *Andromeda*, and Clough's *Bothie of Tober-na-Vuolich*. The following lines from the last show the only varieties of the hexameter which are endurable to the ear i.e. those in which the accent on each foot falls on its first syllable:

Fell he in myrtle | sprigs her | scarves | far in the meadows.
Stunned she | heeding, | leaving | reaps, | full cut | flowing.

It will be observed that on whatever syllable here the metrical accent falls, that syllable is precisely the same which the voice naturally accentuates. Whether this was the case in ancient Greek and Latin hexameters we do not know, but, if the present system of Greek accentuation represents the natural accent of Homeric words, it is certain that Homer disregarded the natural accents, or did not observe our rule of always placing the metrical accent on the first syllable of each foot; and we still pronounce Latin hexameters by preserving what we take to be the natural accent of each word, whether that corresponds to the metrical accent or not. Thus in the line

Ítaliam fáto profugús Lavíniaque | vénit

we disregard the metrical accent, which should fall on the first syllable of each foot (and actually does so in the fifth and sixth), and in reading the line give effect to the natural accents only, as we conceive them, of the words *Italiam, fato, profugus*. Professor T. Arnold, in the appendix on metres in his *Manual of English Literature*, points out that when English hexameters were first written they were constructed in the same manner; they were to be read in the same way as Latin hexameters. The natural accent, except in the last two feet, overruled the metrical. In the following lines from Stanihurst's translation of the *Æneid* it will at once be seen that the effect is absurd if we read the lines as modern English hexameters are read:

Either lets | are couch | ing some | troops of Grecklish as | sembly,
Or to crush | our hul | works this | work is | forged, all | houses
For to pry, | surmount | ing the | town, some | practice or | other.
Here lurks | of evn more; | trust | not this | treacherous | ensign.

If we read by the natural accent the effect is rough and harsh to the ear; if by the modern metrical, ridiculous and absurd. Such are the limitations of the hexameter in English.

Hexapla (Gr. *hexapla*, 'the sixfold'), a celebrated edition by Origen of the Old Testament Scriptures, consisting of the Hebrew text, with a transcript in Greek letters, the Septuagint, and the versions of Aquila, Symmachus, and Theodotion. It is no longer extant. See ORIGEN, SEPTUAGINT.

Hexham, an ancient town of Northumberland, beautifully situated on the right bank of the Tyne, 24 miles W. of Newcastle by rail. A stone bridge of nine arches spans the river, and the town is intersected from east to west by one long street, called in its different parts by the names of Priestpopple, Battle-hill, and Hencotes. Two narrow streets connect with the market-place, one of the most interesting and picturesque in England, from which again other narrow streets diverge irregularly. The great point of interest is the Abbey Church of St Andrew, a noble monument of 13th-century architecture, of which the greater part of the choir, except the eastern chapels, and both the transepts alone remain, the building having been subjected to shameful restoration in 1858, and again in 1869. The monastery was originally founded by St Wilfrid in 674, and his church was long celebrated by the chroniclers as the finest on this side the Alps. Here in 681 a bishopric was established which lasted till 821, when Tidferth, the last bishop, died on a voyage to Rome, having been driven off by the Danes. The ruined church was rebuilt in 1112, and a priory of Austin canons founded, but the monastery was suppressed under Henry VIII., and its last prior hanged at Tyburn for taking part in the Pilgrimage of Grace. The nave of the church was destroyed by the Scots in 1296, and was never rebuilt. Under its ruins was discovered the Saxon crypt of St Wilfrid, a wonderful survival of our earliest architecture, with strange barrel vaults, lamp niches, and funnel-shaped apertures, only to be matched at Ripon. It has been discovered that it was built of Roman stones, most likely carried from the old Roman station of *Corstopitum*, but 3½ miles distant. The central tower is 100 feet high, and of its eight ancient bells one is still called the 'Fray Bell,' from having been rung to give warning in Border alarms. The stone Frith-stool is supposed to have been Wilfrid's chair. The best remains of the monastery are the refectory and the abbey gateway of Norman architecture. To the west of the churchyard is the Seal, once the park of the monks, now a public promenade. Near Hexham the Lancastrians were severely defeated, May 15, 1464. The chief manufactures of the town are gloves and hats. Pop. (1871) 5331; (1881) 5919; (1891) 5945.

See Wright's *History of Hexham* (1823); *The Priory of Hexham, its Chroniclers, Endowments, and Annals*, edited for the Surtees Society by James Raine (1864–65); Hewitt's *Handbook to Hexham and its Antiquities* (1879); and especially the admirable and sumptuous work by Charles Clement Hodges, *The Abbey of St Andrew, Hexham* (privately printed, 1888).

Heylin, PETER, an English divine of considerable note in his own day, was descended from an ancient Welsh family belonging to Montgomeryshire, and was born at Burford, in Oxfordshire, November 29, 1599. He studied at Oxford, where he took the degree of D.D. Through the interest of Laud (q.v.), Heylin was appointed chaplain-in-ordinary to King Charles in 1629. He was deprived of his livings under the Commonwealth; but after the Restoration was made sub-dean of Westminster. He died May 8, 1662. Heylin was a very voluminous controversial writer on the anti-Puritan side, and wrote cosmographies, histories of England, of the Reformation, and of the Presbyterians. See FULLER, THOMAS.

Heyne, Christian Gottlob, a German classical scholar, was born at Chemnitz, in Upper Saxony, 25th September 1729, the son of a poor weaver. In spite of extreme poverty and often absolute hunger, Heyne struggled perseveringly at Leipzig; and in 1753 he obtained the situation of under-clerk in the Brühl library at Dresden. An edition of *Tibullus* and one of the *Enchiridion* of Epictetus, which he published about this time, gained for him the patronage of the celebrated scholar, Ruhnken of Leyden. But the outbreak of the Seven Years' War threw Heyne out of employment, and for some time he led a precarious life, being often without bread, and supporting himself as best he could by writing for booksellers. But in 1763, on the recommendation of Ruhnken, he was appointed professor of Eloquence at Göttingen, and the rest of his long life was spent in comfort and professorial activity. By his lectures and the thorough knowledge he displayed of all departments of ancient Greek and Roman life, he was chiefly instrumental in raising Göttingen to its pre-eminent position as a school of classical study. He is said to have trained more than 130 professors. Heyne died 14th July 1812. His principal works, besides those mentioned, are his editions of Virgil (1767; new ed. 1830–44), Pindar (1773), Apollodorus (1782), and Homer's *Iliad* (8 vols. 1802); numerous translations; six volumes of *Opuscula Academica* (1785–1812); and about 7500 reviews of books in the *Gottinger Gelehrte Anzeigen*, of which he was editor from 1770. Compare the Life of Heyne by his son-in-law, Ludwig Heeren (1813), and Carlyle's essay in vol. ii. of the *Miscellanies*.

Heyse, Paul Johann, German poet, dramatist, and novelist, was born in Berlin on 15th March 1830, and educated at Berlin and Bonn. He was one of the band of writers whom King Max of Bavaria gathered around him in Munich in 1854. Freed from the necessities of earning a livelihood, Heyse has developed an astonishing productiveness. As a writer of novelettes he is an acknowledged master, his work in this department being mostly of the nature of genre-pictures in words. He is not wanting in sly humour, exhibits considerable executive skill and fertility of invention, shows artistic attention to details, and writes in a graceful style; but his work is frequently marred by sensuousness and immoral feeling. He has published more than a score of collections of novelettes under various titles, good specimens of which are contained in *Das Buch der Freundschaft* (1883–84). His poetic works include narrative poems, such as *Urica* (1852), and epics, such as *Die Braut von Cypern* (1856) and *Thekla* (1858). As a dramatist he has been almost as voluminous a writer as in the domain of novels; but few if any of his dramatic pieces have been unequivocally successful. He has also written a couple of more ambitious novels, *Die Kinder der Welt* (1873; 7th ed. 1880) and *Im Paradiese* (1875; 5th ed. 1880), which have been very warmly praised. Nor is his industry yet exhausted; he has translated the poetical works of Giusti (1875), of Leopardi (1874), and of Parini, Monti, and Manzini (1889).

Heywood, a municipal town of Lancashire, 3 miles E. of Bury and 9 N. of Manchester. It is connected with the Rochdale Canal by a branch canal, and is on the Lancashire and Yorkshire Railway. Incorporated in 1881, Heywood has increased with great rapidity, both in population and wealth, since the beginning of the 19th century, partly in consequence of extensive coal-mines in the neighbourhood and partly in consequence of the enterprise of the Peel family, who introduced there the cotton manufacture. Iron and brass founding, boiler-making, and the manufacture of cotton, woollens, machinery, railway plant, and chemicals are carried on. The Free Libraries Act was adopted in 1873; and the Queen's Park, 20 acres in extent, was opened in 1879. Pop. (1851) 12,194; (1881) 22,979; (1891) 23,286.

Heywood, John, the epigrammatist, was born near St Albans about 1497. After his studies at Oxford he was introduced at court by Sir Thomas More, and soon made himself by his merry wit and his skill in music a favourite with Henry VIII., and later with Mary. He was a devout Catholic, and on the accession of Elizabeth betook himself to Malines, where he died in 1580. He wrote several short plays which he called interludes. The name had hitherto meant short dramatic pieces performed in the intervals of a banquet or court-pageant, in which the characters were merely personified qualities, but Heywood introduced the novelty of making these individual persons represent classes, as the Pedlar, the Pardoner, and the like, instead of Youth, Felicity, &c. His interludes thus form an important stage between the old moralities and the modern drama. Among them are *Johan, Tyb his wife, and Sir Johan the preste; A Mery Play betwene the Pardoner and the Frere, the Curate and Neighbour Pratte;* and *The Play called the four P's, a new and very Merry Interlude of a Palmer, a Pardoner, a Poticary, and a Pedlar.* His three collections of *Epigrams* reach the number of six hundred. His longest work is the wearisome allegorical poem, *The Spider and the Fly*, in which the relative merits of Catholics and Protestants are contrasted.

Heywood, Thomas, dramatist and actor, a Lincolnshire man, was educated at Cambridge. He seems to have been writing plays as early as October 1596; and on 25th March 1598 he was regularly engaged by Philip Henslowe as an actor. Of all the old dramatists he was the most prolific. We learn from the preface to *The English Traveller* that down to 1633 he had 'had either an entire hand, or at the least a main finger,' in the composition of 220 plays; and he continued for some years after that date to write for the stage. He was also the author of an historical poem, *Troja Britannica* (1609, folio); an *Apology for Actors* (1612); *Nine Bookes of Various History concerninge Women* (1624); a folio of nearly five hundred pages, which was planned, written, and printed within the space of seventeen weeks; a long poem, with learned and curious annotations, *The Hierarchie of the Blessed Angells* (1635, folio); a volume of rhymed translations from Lucian's *Dialogues*, Erasmus, Ovid, &c.; various mayoralty pageants, and divers tracts and treatises. His projected *Lives of all the Poets, Modern and Foreign*, was unfortunately never published. In 1624, and again in 1635, he refers to this work; and we know from Richard Brathwait's *Scholar's Medley* that he was engaged upon it as early as 1614. The last of Heywood's publications was *The Life of Ambrosius Merlin* (1641). It is usually supposed, but without sufficient evidence, that he was alive in 1648, when he was mentioned in the *Satire against Separatists*.

Twenty-four of Heywood's plays have come down. The best is *A Woman kilde with Kindnesse* (1607), a pathetic tragedy of domestic life; and with this may be coupled *The English Traveller* (1633), which contains some admirable scenes, but ends somewhat abruptly. Heywood was particularly successful in depicting blameless English gentlemen, such characters as Master Frankford in the earlier play and young Geraldine in the later. His work is usually distinguished by naturalness and simplicity; but he wrote at the beginning of his career one absurdly grandiose play, *The*

Foure Prentices of London, printed in 1615, which was parodied in Beaumont and Fletcher's *Knight of the Burning Pestle*. In the two parts of *The Fair Maid of the West* (1631), and in *Fortune by Land and Sea*, partly written by William Rowley and first printed in 1655, he gives us some spirited descriptions of sea fights. *The Four Maids of the Exchange* (1607), a sentimental comedy, has a very improbable plot; *The Rape of Lucrece* (1608) is chiefly noticeable for its songs; *Love's Mistresse* (1636), dealing with the story of Cupid and Psyche, is fanciful and ingenious; and there is much tenderness in *A Challenge for Beautie* (1636). In the Four Ages—*The Golden Age* (1611), *The Silver Age* (1613), *The Brazen Age* (1613), and the two parts of *The Iron Age* (1632)—Heywood dramatised classical mythology, 'from Jupiter and Saturn to the utter subversion of Troy. These plays are undeniably tedious, but contain some charming poetry. *The Late Lancashire Witches* (1634), written in conjunction with Richard Brome, is largely of a farcical character; and *The Wise Woman of Hogsdon* (1638) exposes the trickeries of fortune tellers. In *The Royall King and Loyall Subject* (1637) the doctrine of passive obedience to kingly authority is carried to extreme lengths. The early plays, *Edward IV.* (2 parts, 1600) and *If You know not Me You know No Bodie; or, the Troubles of Queen Elizabeth* (1605–32), are of small account; nor can much be said in favour of *A Maydenhead Well Lost* (1634). *The Captives, or the Lost Recovered*, an interesting play acted in 1624, was first published in 1885 from Egerton MS. 1994 (Bullen's 'Old Plays,' 1st series, vol. iv.). A collection of Heywood's plays, in six volumes, was issued in 1874 (London, John Pearson). In tragic power he was deficient, but his gentleness and sincerity endear him to students.

Hezekiah (Heb. *Hizkiah*, *Yehiskiyahu*, 'May Jehovah strengthen him'), a reforming king of Judah, son and successor of Ahaz, reigned from 728 to 697 B.C. His reign is remarkable for the invasions by the Assyrians under Sargon, and again under Sennacherib. When Sennacherib appeared before Jerusalem 'an Angel of the Lord' (explained variously to mean the plague, an earthquake, a sudden attack by Tirhaka, or the simoom) slew during one single night 180,000 men in the Assyrian camp, and Sennacherib was obliged to retreat. (See 2 Kings, xviii.–xx., and 2 Chron. xxix.–xxxii.) The events of this period as recorded in Assyrian records are treated at Assyria (q.v.). After the war he collected great treasures and executed many highly useful works, among which the aqueducts of Jerusalem take a foremost place. His was also the golden age of prophetic poetry. He was succeeded by his son Manasseh.

Hiawatha, the name by which the Iroquois call a personage of miraculous birth (elsewhere amongst the North American Indians known as Michabou, Chiabo, &c.) sent amongst them to clear the rivers and forests, and teach the arts of peace. Longfellow's poem (1842) is based on Schoolcraft's version of the tradition ('Algic Researches,' 1839; republished as *The Myth of Hiawatha*, 1856).

Hibbert Lectures, a foundation instituted by the trustees of Robert Hibbert (1770–1849), a West India merchant. For many years the trustees applied the funds mainly to the higher culture of students for the Unitarian ministry, but in 1878 resolved to institute Hibbert Lectures, with a view to capable and really honest treatment of unsettled problems in theology, apart from the interest of any particular church or system. Amongst the lecturers have been Max Müller, Page Renouf, Renan, Rhys Davids, Kuenen, Beard, Reville, Pfleiderer, Rhys, Sayce, and Hatch.

Hibernation (Lat. *hibernare*, 'to pass the winter'), a physiological term employed to describe the habit which certain northern, and most probably some Antarctic mammals, reptiles, fishes, insects, and molluscs have of passing part of the year, almost invariably the coldest winter months, in a more or less continuously torpid condition, from which they revive either at irregular intervals, or altogether on the return of warm weather. Hence the Germans express this condition by the word *winterschlaf* ('winter sleep') in contradistinction to *sommerschlaf*, 'summer sleep' or æstivation, an analogous, though not identical, trait of some southern animals during the summer months.

As far as mammals are concerned, the following are the principal facts established: (1) All northern species, even those which find food scarce during winter, do not hibernate, nor do all the species of the same family, order, or genus. Even both sexes of the same species do not always agree in this respect. The bear, the badger, the dormouse, the hamster, the bat, the marmot, the zizel, and the hedgehog are among the best known and most pronounced hibernators. But while all the burrowing marmots, whistlers, woodchucks, ground-hogs, &c. are more or less complete hibernators, the alpine marmots (*Arctomys marmotta*) indulge in this habit by fits and starts. The sloth bear (*Melursus labiatus*) and other Indian Ursidæ differ from the other members of their family in remaining awake during winter, though they are sluggish during this season, moving about very little, and then only occasionally when they require food; and both the black and brown bear of the Rocky Mountains and the polar bear are strict hibernators only as regards their females, the male being often seen at large between November and May. Most of the American squirrels differ from the European species in being non-hibernating. (2) The same animal may vary in this respect in different portions of its range. Thus, though the American skunks are in the northern part of the region over which they roam more or less complete hibernators, they get more and more wakeful as their range extends equatorially, until in the most southern part of it they move about freely at all seasons of the year. In like manner, the prairie 'dog,' or marmot (*Cynomys ludovicianus*), in the northern plains retires to sleep during severe weather, as do also the woodchucks of the same region, but in open winters and on pleasant days they display no such tendency; while in the extreme southern limits of their range they are not hibernators at all. (3) They do not all retire at the same time. Most of the true hibernators take to their 'hibernaculum,' or winter hole—a burrow, a hollow tree, a cave, the eaves of a house, or similar situation—in late autumn, varying the date slightly according to weather. But the great bat (*Scotophilus noctula*) is rarely seen after September, and often retires as early as the end of July, when its insect food is abundant. (4) All of them do not sleep the same length of time, or with the same torpidity, and several indulge in hibernation and waking alternately during the winter. The squirrel, in Britain, lies dormant most of the cold season; but on sunshiny days it often wakes, visits its hoards of food, eats freely, and then retires to rest again. The hedgehog is sometimes seen during the winter; and on sunshiny days the common bat often emerges from its hibernaculum, and flits about even when snow is on the ground. The dormouse also at intervals wakes up, eats, and goes to sleep. Other animals, like the long-tailed field-mouse, pass the winter in a drowsy state not far removed from dormancy. There are thus all gradations between continuous winter dormancy

and the ordinary daily sleep of a few hours in which every animal indulges. There is also every degree of torpidity exhibited. The hedgehog and the dormouse may be rolled over and over like a ball, without waking, and the black bear of America is extremely difficult to arouse out of its winter sleep. On the other hand, the brown bear of Siberia hibernates lightly, and is very dangerous when awakened. The hedgehog, if disturbed, takes a 'deep sonorous inspiration, followed by a few feeble respirations, and then by total quiescence.' This differs from the stirring and then coiling itself up again which is the animal's way when awakened out of an ordinary sleep. But, though sensation and volition are dormant, the reflex and excito-motory actions are keen, the slightest touch applied to the spines of a hedgehog or to the wings of a bat inducing one or two inspiratory movements. But the hibernating badger is not difficult to reawake, and in its torpor, like all hibernating animals, is not rigid. (5) Continuous hibernators do not lay in stores of food. Intermittent winter-sleepers generally do, while some animals which are not true hibernators, but remain only drowsy during the winter, retire to their burrows to pass the days of famine above ground in the midst of their abundant nuts and other provender. All of these food-storers are vegetable-eaters. The arctic fox is indeed the only exception to this rule, for though it is not any more than the beaver a hibernator, it hoards up dead lemmings, ermines, geese, hares, &c. against the evil days of winter. An exception to intermittent hibernators being thus provident is afforded by the porcupine (*Hystrix cristata*) and the alpine marmot.

In its most pronounced forms hibernation differs physiologically in several important steps from ordinary sleep, though it is undoubtedly linked with this function by a regular chain of links. Cold we know produces drowsiness, which ends in a fatal torpor, and on warm days a sleep steals over the eyes which might, in kind if not in degree, be compared with the æstival torpor of some animals. In other respects, hibernation is more akin to trance. Yet what is most puzzling about it is that it affects only some animals which differ little in habit from others which keep awake all winter, and in the same region find food in abundance. The polar bear sleeps while seals are plentiful on the ice-floes, and the Noctule bat retires while the cockchafers, in which it delights, are numerous. Still, as it enables animals to live within their area which might otherwise require to migrate, we cannot refuse to admit that hibernation plays an important part in the struggle for existence, the survival of the fittest, and the means whereby animals are confined within certain zoo-geographical regions. But how it originated, or whether it is a survival, like migration, from a former condition of things, are problems which in the present state of our knowledge cannot be satisfactorily solved.

Hibernators, when they retire for the winter, are unusually fat: when they emerge from their hibernaculum they are unwontedly lean. They all try to keep warm, the heat of their body being nearly that of their hibernaculum. Yet if exposed to greater cold they revive, and, if the temperature is still further lowered, like other animals they freeze to death. Reviviscence is probably due to the calls of nature, the observations of Horvath on a zizel (*Spermophilus citillus*) showing that the heat of the circumambient air does not rise while the animal is awaking, though the temperature of its body does. During dormancy the animal functions are all but suspended. Excretions in the bat are reduced to almost nothing, and the bears close the lower end of their alimentary canal by a resinous plug, known in Sweden as 'tappen.' Respiration and circulation are reduced to a minimum. The air of a closed jar containing a hibernating dormouse is unaltered. Others can survive long in an atmosphere deprived of oxygen. A bat in a lethargic condition has remained sixteen minutes under the water; and though three or four minutes' immersion will, under other circumstances, suffice to drown a hedgehog, in a state of winter torpidity it can bear twenty-two and a half with impunity (Marshall Hall). Carbon dioxide has so little effect on a torpid marmot that one lived after being four hours in this poisonous gas. Simon and Friedleben noticed that in some hibernators the thymus gland gets laden with fat just before they retire for the winter, and Barkow has described a portion of this as the 'hibernating gland.' In this special organ, he claims, the fat is transformed into a store of animal starch and sugar, by which the heart and muscles are fed during the period of torpidity. But his observations have not been confirmed, this gland not existing in all hibernators; nor is it at all certain that such is its use. Moreover, contrary to his assertion, hibernators do lose weight, often to the extent of 30 and 40 per cent., in this respect resembling starving animals.

Hibernation in other animals has not been so closely studied. All reptiles and batrachia become torpid during cold weather, snakes passing the winter in tangled knots as if for warmth: if the viper is aroused at this season its venom is said to be inert. Alligators creep into holes in the river-banks, and frogs lie dormant in the mud at the bottom of ponds. Many fishes (carp, roach, chub, minnows, eels, the Mediterranean muræna, &c.) also retire into some deep recess, or into the mud, though their condition at this period is not that of the true hibernators. Their vitality only is lowered. In winter all land-snails hibernate by closing the mouths of their shells with a plate (the epiphragm), leaving only a little hole in the middle of it for breathing. Slugs also become torpid in holes in the ground, and the fresh-water mussels (Unio, Anodonta, Dreissena) bury themselves in the pond and river mud until the cold months are over. The torpidity of insects in the pupa and other stages is well known. Individuals belonging to the Vanessa group of butterflies which hibernate in the *imago* stage occasionally emerge during mild winter days. But hive-bees do not hibernate, food being necessary for their subsistence during the flowerless season.

See ANIMAL HEAT and PHYSIOLOGY; TEMPERATURE OF THE BODY; also Barkow's *Der Winterschlaf nach seinen Erscheinungen im Thierreich dargestellt* (1846); Friedleben's *Die Phys. der Thymus Drüse* (1858); Simon's *Physiological Essays on the Thymus Gland* (1845); Lloyd's *Field Sports of the North of Europe* (1885), pp. 124-125; Marshall Hall in Todd's *Cyclopædia of Anatomy and Physiology* (vol. ii. p. 771 *et seq.*); Newport, *Philosophical Transactions* (1837); Brown's *Mammals of Greenland* (Admiralty Manual, 1875, p. 16); and *Our Earth* (1890), vol. iii. pp. 29-30; Duns in *Science for All* (vol. v. p. 240), &c.

Hibernia. See IRELAND. For the Hibernian School, see ROYAL MILITARY ASYLUM.

Hibiscus, a genus of plants of the natural order Malvaceæ, the type of a tribe or sub-order distinguished by a double calyx and fruit of three or more many-seeded carpels united into a many-celled capsule. The species are numerous, natives of warm climates, some of them trees or shrubs, but most of them large herbaceous plants, annual or perennial. The flowers of many are very beautiful; in the South Sea Islands they are much used for personal adornment. *H. syriacus*, sometimes

but erroneously called *Althæa frutex*, a native of Syria and Carniola, has long been in cultivation as an ornamental shrub, and proves sufficiently hardy in many parts of Britain. Many are favourite hothouse plants. The characteristic mucilaginous and fibrous properties of the Malvaceæ are very strongly developed in this tribe. The fruit of *H. esculentus*, or *Abelmoschus esculentus*, is in general use both in the East and West Indies as an article of food; its name in the West Indies is Gobbo. It is an annual plant, with a soft herbaceous stem, 3 to 5 feet high, crenate leaves, axillary sulphur-coloured flowers, and pyramidal, somewhat podlike capsules. It is cultivated in some parts of the south of Europe.

Hibiscus esculentus, upper part of a flowering plant:
a, unripe fruit; *b*, section of do.
(Bentley and Trimen.)

The fruit is used in an unripe state. It is generally much esteemed, but is disliked by some on account of its viscidity. It enters, as an important ingredient, into the *pepper pot* of the West Indies. The ripe seeds are sometimes used in soups as barley. The bark of *H. tiliaceus*—a tree 20 feet high, with a very thick hole—abounds in mucilage that by chewing it the natives of the South Sea Islands obtain nourishment in times of scarcity. This tree is one of the most abundant trees of the South Sea Islands; and the wood, being light, tough, and durable, is much used for many purposes. From its fibre the Tahitians manufacture matting fine and coarse, the latter for sleeping upon, the former for protection from wet during the rainy season, and they also make ropes and twine of the same. The bark is very fibrous, and cordage and matting are made of the fibre in various tropical countries. Many other species yield fibres, some of them coarse, some of them fine and beautiful, which are used in different countries; but the most important in this respect is *H. cannabinus*, the Deccan Hemp of western India (see FIBROUS SUBSTANCES). *H. sabdariffa* is very generally cultivated in warm countries, on account of its calyx, which, as the fruit ripens, becomes fleshy, and acquires a very pleasant acidity. It is much used for making tarts and jelly, and a decoction of it, sweetened and fermented, affords a refreshing beverage, well known in the West Indies as *Sorrel Cool Drink*, the plant being called Red Sorrel; and in the Madras territories it is used for similar purposes, and is named *Rozelle* or *Rousselle*. *H. Abelmoschus* (or *Abelmoschus moschatus*), sometimes called Musk Seed, another plant common in widely separated tropical countries, is cultivated for its seeds, which have a fragrance between that of musk and that of amber. They are much used by perfumers, and are called *Ambrette* or *Graines d'Ambrette*. In Egypt and Arabia they are mixed with coffee, and stimulant and stomachic qualities are ascribed to them. The petals of *H. Rosa-Sinensis* possess astringent properties, and they are also used by the Chinese to stain their eyebrows and their shoes black.

Hiccup, or HICCOUGH, is caused by an involuntary contraction of the Diaphragm (q.v.), while the glottis is spasmodically closed. The inward current of air through the narrowed aperture, and its sudden arrest when the glottis closes, cause the characteristic sound. Usually the paroxysm only lasts for a few minutes, but it may sometimes extend to hours or days. The most common cause of hiccup is some disordered condition of the stomach. Very obstinate hiccup sometimes occurs in various diseases, especially fevers and diseases of the lungs and liver; and may be a very serious complication in consequence of the exhaustion it produces. Sometimes it has a nervous origin.

When the attack is slight it may often be stopped by making a very full inspiration, and then holding the breath as long as possible, the diaphragm being thus kept in a state of voluntary contraction. A draught of cold water, a start or blow, or strong pressure round the waist will sometimes give relief. In more obstinate cases a combination of camphor or of opium with chloroform, and the frequent swallowing of small rounded pieces of ice, are perhaps the most efficient remedies. Bismuth, nux vomica, bromide of potassium, and many other drugs have also been recommended.

Hickes, GEORGE, nonjuror and philologist, was born at Newsham, Yorkshire, June 20, 1642. He studied at Oxford, in 1664 was elected Fellow of Lincoln College, and in 1666 took holy orders. In 1676 he became chaplain to the Duke of Lauderdale, whom he accompanied to Edinburgh. In 1678 he received the degree of D.D. from the university of Glasgow, and next year from Oxford. In 1682 he was appointed one of the king's chaplains, and the following year made Dean of Worcester. Refusing at the Revolution to take the oaths to King William III., he was deprived of all his benefices. In 1693 he was sent with a list of the nonjuring clergy to the exiled king at St Germains, and in 1694 was consecrated by a prelate of his own party Suffragan Bishop of Thetford. His publications in controversial and practical divinity are numerous. His greatest work, entitled *Thesaurus Grammatico-Criticus et Archæologicus Linguarum Veterum Septentrionalium*, appeared at Oxford in 1705, 3 vols. fol., and in 1689 he had published a grammar of Anglo-Saxon and Mœso-Gothic. He died December 15, 1715.

Hickory (*Carya*), a genus of trees formerly included among Walnuts (Juglans). The hickories are exclusively North American. They are large and beautiful trees, attaining a height of 70 or 80 or even 100 feet, with pinnate compound leaves. The timber of all of them is very heavy, strong, and tenacious, but decays speedily when exposed to heat and moisture, and is said to be peculiarly liable to injury from worms. Great quantities of hickory are used to make hoops for casks. It is much used for handspikes, and shafts of carriages, handles of axes and golf-clubs, large screws, &c. are made of it. It is greatly esteemed for fuel. The nuts of some of the species are excellent eating, and in flavour resemble walnuts. They are enclosed in husks which split up into four equal valves; the surface of the nut is smooth, with four or more ridges running lengthwise, and meeting, especially in *C. sulcata*, in sharp points at either end.—*C. alba*, the Shell-bark or Shag-bark Hickory, so called from its shaggy outer bark, which peels off in long narrow plates, yields the common *hickory-nut* of the northern parts of the United States. The trunk is slender, and the tree occasionally reaches a height of from 80 to 100

feet. Its compound leaves are often 20 inches long. The nuts have a delicious flavour, and are in considerable request. The shell is thin but hard, the kernel sweet. –*C. sulcata*, the Shell-bark Hickory of the West, is a very similar tree, found from Pennsylvania to Wisconsin.—*C. olivæformis*, a western and southern species, yields the well-known Pecan Nut -in which the internal partitions common to the other hickories with the walnut are lacking. It is a handsome tree of 60 or 70 feet high –in some cases reaching 90 feet. –*C. tomentosa* yields the Mocker Nut, and *C. amara* the Bitter Nut; while the Pig-nut Hickory, also with a bitter nut, is *C. porcina*.

Hicks, Elias, a celebrated American preacher of the Society of Friends, was born at Hempstead, Long Island, March 19, 1748. At the age of twenty-seven he was already a well-known preacher, and for many years he travelled through the States and Canada, receiving no compensation for his labours, and when not preaching labouring on his own farm. He was one of the first in his body to agitate against slavery. An able preacher, he exercised great influence among his co-religionists until his unitarianism, or denial of the divinity of Christ and a vicarious atonement, brought him into disfavour with orthodox Friends; but he published his own views with perseverance, and at the age of eighty still travelled and preached. The result of his labours was a schism of the society into two divisions, popularly known as Orthodox and Hicksite Friends (see Friends). He died at Jericho, Long Island, February 27, 1830. See his *Journal* (Phila. 1828) and *Letters* (1834).

Hidalgo, a word explained as being originally *hijo de algo*, 'son of something,' is the title of a member of the lowest class of Spanish nobility.

Hide, in old English law, denoted a certain area of land, the exact quantity of which is variously given as 60, 80, and 100 acres. According to R. W. Eyton (*Key to Domesday*, 1877), the Domesday hide of land denoted fiscal value, not superficial quantity.

Hides. See Leather.

Hieracium. See Hawkweed.

Hierapolis, two ancient cities of the Orient. (1) Hierapolis, or on coins Hieropolis, was a city of Syria Cyrrhestica, and stood on the high-road from Antioch to Mesopotamia, 14 miles W. of the Euphrates. Under the Seleucid kings this city was an important centre of trade, particularly in cotton and silk. The great temple of Astarte (locally known as *Bambyke* or *Mambog*) was plundered by Crassus in 53 B.C. With the growth and spread of Christianity, Hierapolis gradually lost its importance. Passing into the hands of the califs, it was refortified by Haroun al-Raschid about the beginning of the 9th century. It was captured by Romanus Diogenes in 1068, and was again stormed by Saladin in 1175. Its decay dates from the time of the Mongol invasion.—(2) Hierapolis was the name given to a city of Phrygia, situated between the rivers Lycus and Meander, 5 miles N. of Laodicea. It was celebrated for its hot springs, and for a cave, called Plutonium, whence issued mephitic vapours that proved fatal to life. At Hierapolis, the birthplace of Epictetus, Cybele was much worshipped; and there St Paul founded a Christian church. See *Harper's Magazine*, October 1889.

Hierarchy (Gr. *hieros*, 'sacred,' and *archō*, 'I govern'), the name used to designate the whole sacred governing and ministering body in the church, distributed according to its several gradations. See Orders (Holy), Bishop, Priest, Deacon; also Pope.

Hieratic Writing. See Hieroglyphics.

Hiero I., king of Syracuse, succeeded his brother Gelon in 478 B.C. The most important event of his reign was the naval victory gained by his fleet and that of the Cumani over the Etruscans in 474, which deprived the latter of their supremacy in the Tyrrhenian Sea. Though violent and rapacious, he was a lover of poetry, and the patron of Simonides, Æschylus, Bacchylides, and Pindar. Hiero died at Catana in 467 B.C.

Hiero II., king of Syracuse (270–215 B.C.), was the son of a noble Syracusan named Hierocles. During the troubles which prevailed in Sicily after the retreat of Pyrrhus (275 B.C.) Hiero greatly distinguished himself, and was first appointed commander-in-chief and then elected king of the Syracusans. He joined the Carthaginians in besieging Messana, which had surrendered to the Romans; but he was beaten by Appius Claudius, the Roman consul, and compelled to return to Syracuse. In 263, however, he concluded a peace with the Romans for fifteen years, during which he proved so faithful to his engagements that in 248 peace was permanently established. In the second Punic war Hiero likewise proved himself the faithful ally of the Romans, and supported them with money and troops, especially after their defeat at the lake of Thrasymene. He died in 215, and was succeeded by his grandson Hieronymus. Hiero, by his clemency, wisdom, and simplicity, quite gained the affections of the Syracusans, and his financial arrangements were adopted by the Romans when they subsequently conquered Syracuse. He devoted great attention to the improvement of agriculture, and his laws respecting the tithe of corn, &c. (*Leges Hieronicæ*) were still in force in the country in Cicero's time. He was likewise a patron of the arts, particularly architecture; and Archimedes was his relative and friend.

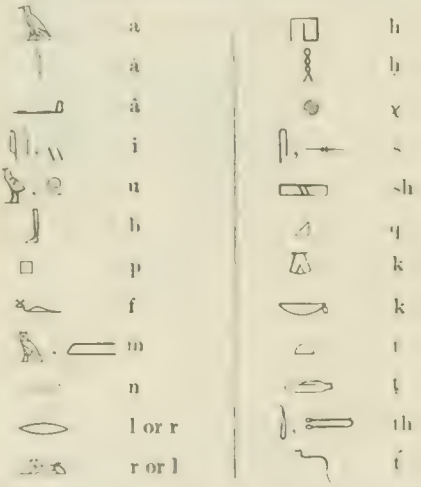
Hierocles, the Neoplatonist, lived at Alexandria about the middle of the 5th century, and enjoyed a great reputation. He is usually reckoned the author of a commentary on the golden verses of Pythagoras (edited by Mullach, 1853). A collection of jests (*Asteia*) used also erroneously to be fathered on him.

Hieroglyphics (literally 'sacred sculptures,' from *hieros* and *glyphō*), a term applied to the representations of objects used to express language, especially those which the ancient Egyptians, Mexicans, and other nations employed for that purpose. The term *hieroglyphs* would, however, be more correctly applied to these figures. The number of those used by the ancient Egyptians was probably about 1700, and by means of them they were enabled to express all their ideas with correctness, clearness, and facility. They consist of representations of figures of men and women and their limbs; quadrupeds, birds, fishes, and reptiles; plants, trees, and flowers; celestial bodies; mountains, islands, stones, water; towns, buildings, rooms and parts of a house; fighting implements and sceptres; articles of furniture; musical instruments; mathematical figures; crowns and baskets; ships and their various parts, &c. Hieroglyphics were inscribed upon granite, basalt, porphyry, and sandstone; they were cut or painted upon wood and plaster; and they were written upon papyri, slabs of calcareous stone, and leather. A reed pen,

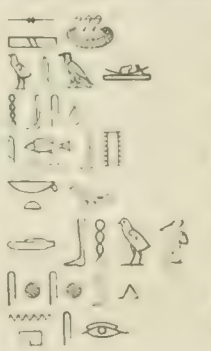
qush, was used for writing upon papyri. The palette used for holding the ink was usually a flat, rectangular piece of wood or ivory measuring about 2½ inches by 12. At one end of this two or more holes were hollowed out for holding ink. The colours most commonly used were black, red, and green; the first was made from vegetable, the second and third from mineral substances.

Inscriptions on Egyptian monuments are sometimes inlaid with colours, an attempt being made to imitate the natural colours of the animals and objects, representations of which are employed to form the inscription. The painted inscriptions which are found upon the inner coffins in the tombs of the 18th and 19th dynasty usually follow a conventional design; the number of colours used upon them being comparatively few, six at the most. But on the Ani papyrus in the British Museum as many as thirteen colours are used. On papyri they are usually drawn in outline in black. The rubrics and initial words are usually written in red. Hieroglyphics are written in horizontal lines or perpendicular columns, which are separated by lines drawn in black ink. Usually they are to be read in the direction in which they face, and are so arranged as to cover completely all the parts of the papyrus which were to be written on. Egyptian hieroglyphics are read in the order in which they are written; this order is sometimes broken for the sake of symmetrical arrangement.

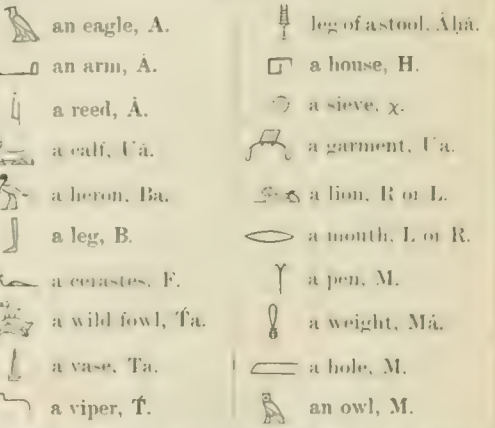
Hieroglyphics are either phonetic or ideographic: the former class comprises signs which represent sounds, and the latter those which represent ideas. Phonetic signs are either alphabetic or syllabic. The hieroglyphic alphabet is as follows:



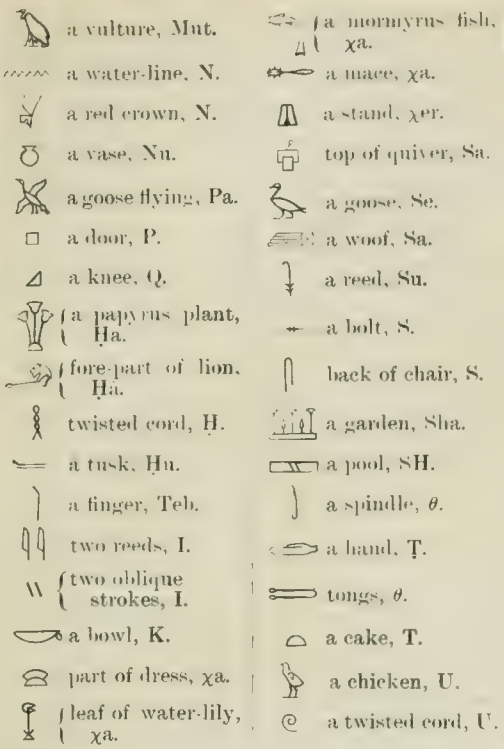
The earliest Egyptian hieroglyphic inscriptions known to us are filled with the alphabetic signs here given; this fact shows that so far back as 3800 B.C. the use of phonetic signs was well known and used. The other phonetic signs have syllabic values. A large number of the hieroglyphics are employed as *ideographs*, or representations of ideas. Every word in Egyptian has one *determinative* or more at the end of it. Thus, after the word for tree we have the picture of a tree, ; and after the word for dog we have the picture of a dog, . An abstract idea, such as joy or gladness, was expressed by the figure of a woman beating a tambourine, or a man dancing, or by the figure of some object possessing it, as , a jackal, to express the idea of cunning or craft; , a seated man, signifying man, was applied to all relationships, functions, and offices of men, as *âtf*, 'father;' *sen*, 'brother;' *mer*, 'governor;' *hen*, 'priest;' *bak*, 'labourer:' the special meaning which it conveyed being shown by the phonetic groups which preceded it. In the same way all beasts, or objects made of leather, were expressed by a skin, ; all precious stones or objects made of the same, by ○; all actions of moving, standing, or stretching, by two legs, ; and all actions in which the idea of strength was to be conveyed, by an arm and a stick, . The number of these signs may be computed at about 150, and they resemble in their use those of the Assyrian cuneiform, in which, although to a more limited extent, the leading classes of thought were determined by a character prefixed or affixed to the phonetic group giving the particular idea. Thus, in the Assyrian, all names of men are preceded by a single upright wedge, ; all countries by ; names of horned cattle by ; and after the names of certain places, Babylon, for example, is affixed. In the Egyptian system, however, the determinatives are always placed after the phonetic groups, and are more numerous. The Chinese system of writing approaches still more closely to the Egyptian, 242 radicals, as they are called, but really determinatives, being placed after other groups and symbols, which indicate the special idea intended. In this last language the radicals are generally placed to the left, except in those instances in which they enclose the phonetic or special groups. In the Egyptian hieroglyphs every word not expressing an abstract idea, such as the verb 'to be,' or the grammatical forms and pronouns, is accompanied by its determinative, and is incomplete without it. The following examples will illustrate the use of determinatives in Egyptian:



SPECIMENS OF ALPHABETIC AND SYLLABIC HIEROGLYPHIC CHARACTERS.*



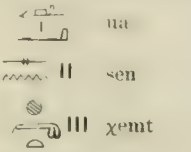
* The first font of hieroglyphic type was cut in England from drawings by the late Mr Bonomi. For the hieroglyphics used in this article we are indebted to Messrs Harrison, printers, London.

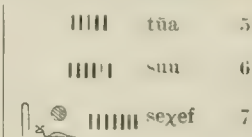


Under the rule of the Ptolemies in Egypt the values of the hieroglyphs were systematically changed. Thus , *χen*, became *m*; , *nes*, became *n*, and so on. The various forms of the same vowel were confused with one another, and many changes between consonants took place.

The *language* of the hieroglyphs is most nearly represented by Coptic. Coptic is a name given to the Egyptian language written with the letters of the Greek alphabet, and a few signs borrowed from the demotic forms of some of the hieroglyphs. The Bible was translated into Coptic early in the 3d century A.D., and the greater part of this work, indispensable for the proper study of the hieroglyphs, has come down to our time. Coptic literature is chiefly theological, and the texts are full of Greek words. The forms of Egyptian words as given in the hieroglyphs are often considerably modified in Coptic; many of the changes are caused by phonetic decay. The Coptic language ceased to be spoken about a century ago. See COPTS.

In Egyptian the noun has two genders, masculine and feminine: feminine nouns usually end in *t*. Plural nouns end in *u* or *iu*, and are generally followed by or . In Egyptian nouns have no declensions, and the cases are expressed by particles placed before nouns. Adjectives have no grammatical forms to indicate degrees of comparison. The following are the principal Egyptian numerals:

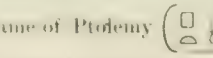




The personal pronouns are: *nuk* or *ānuk*, 'I': *entuk* (masc.), *entut* (fem.), 'thou;' *entuf*, 'he.' *entus*, 'she;' *entuten*, 'you' (plur.); *entusen*, *entu*, 'they.' The personal suffixes are *ā*, 'I,' *k*, 'thou (masc.), *t*, 'thou' (fem.); *f*, 'he,' *s*, 'she;' *n*, 'we;' *ten*, 'you;' *sen*, *set*, 'they.' The Egyptian verb has no tenses, moods, voices, conjugations, or personal endings. The exact meaning of a verb must be gathered from the context or the syntax of the sentence. The Egyptian verb is often accompanied by one of the following auxiliary verbs: *ān*, 'be;' *un*, 'be,' 'to arise;' *ārі*, 'do;' *āḥā*, 'stand;' *tā*, 'give.'

Considered as one of the most ancient written languages, Egyptian throws great light upon comparative philology, the relative antiquity of various words and locutions, the general construction of language itself, and the development of picture writing into the abstract ciphers of sound, called letters. During the 19th dynasty, or about 1400 B.C., many Semitic words were introduced into the language by the success of the Egyptian arms in the East, and such words as *bata* for *Beth*, 'a house,' *makaturu* for *Migdol*, 'a tower,' and others, appear; they are, however, rare and few in number compared to the body of the language.

The invention of hieroglyphs, called *Neter kharu*, or 'divine words,' was attributed to the god Thoth, the scribe of the gods, and lord of the hieroglyphs. Pliny attributes their invention to Menon. The literature of the Egyptians was in fact styled Hermaic or Hermetic, on account of its supposed divine origin, and the knowledge of hieroglyphs was, to a certain extent, a mystery to the ignorant, although universally employed by the sacerdotal and instructed classes. To foreign nations the hieroglyphs always remained a mystery, although Moses is supposed to have been versed in the knowledge of them (Philo, *Vita Mogsis*). The Greeks, who had settled on the coast as early as the 6th century B.C., appear not to have possessed more than a colloquial knowledge of the language; and although Solon, 538 B.C., is said to have studied Egyptian doctrines at Sebennytus and Heliopolis, and the doctrines of Pythagoras are thought to have been derived from Egypt, these sages could only have acquired their knowledge from interpretations of hieroglyphic writings. Hecatæus (521 B.C.) and Herodotus (456 B.C.), who visited Egypt in their travels, obtained from similar sources the information they have afforded of the language or monuments of the country. Democritus of Abdera, indeed, about the same period (459 B.C.), described both the Ethiopian hieroglyphs and the Babylonian cuneiform, but his work has disappeared. After the conquest of Egypt by Alexander, the Greek rulers began to pay attention to the language and history of their subjects; and Eratosthenes, the keeper of the museum at Alexandria, and Manetho, the high-priest of Sebennytus, drew up accounts of the national chronology and history from hieroglyphic sources. Under the Roman empire, in the reign of Augustus, one Chæremon, the keeper of the library at the Serapeum, compiled a dictionary of the hieroglyphs; and both Diodorus and Strabo mention them, and describe their nature. Tacitus, later under the empire, gives the account of the monuments of Thebes translated by the Egyptian

priests to Germanicus; but after his time the knowledge of them beyond Egypt itself was exceedingly limited, and does not reappear till the third and subsequent centuries A.D., when they are mentioned by Ammianus Marcellinus, who notes the translation of one of the obelisks at Rome by one Hermapion, and by Julius Valerius, the translator into Latin of the apocryphal life of Alexander, who gives that of another. Heliodorus, a novelist who flourished 400 A.D., describes (iv. 8) a hieroglyphic letter written by Queen Candace. The first positive information on the subject is by Clement of Alexandria (211 A.D.), who mentions the symbolical and phonetic, or, as he calls it, cyriologic nature of hieroglyphics. Porphyry (304 A.D.) divides them also into cœnologic or phonetic and enigmatic or symbolic. Horapollo or Horus Apollon, who is supposed to have flourished about 500 A.D., wrote two books explanatory of the hieroglyphs, a rude, ill assorted confusion of truth and fiction, in which are given the interpretation of many hieroglyphs and their esoteric meaning. After thiswriter all knowledge of them disappeared till the revival of letters. At the beginning of the 17th century these symbols first attracted attention, and about 1650 Athanasius Kircher, a learned Jesuit, pretended to interpret them by vague esoteric notions derived from his own fancy, on the supposition that the hieroglyphs were ideographic—a theory which barred all progress, and which was held in its full extent by the learned, till Zoega in 1787 first enunciated the proposition that the ovals or cartouches contained royal names, and that the hieroglyphs, or some of them, were used to express sounds. More monuments were known, and more correct ideas had begun to dawn on the European mind; and the discovery by the French, in 1799, of the Rosetta Stone, a slab of black basalt, having inscribed upon it, first in hieroglyphics, secondly in demotic or enchorial (a cursive popular form of writing extant at the period), and thirdly in Greek, a decree of the priests of Egypt assembled in synod at Memphis, in honour of Ptolemy V., gave the first clue to the decipherment. The first attempts were made upon the demotic text by Silvestre de Sacy with some success, but it was soon discovered that the demotic was not purely alphabetic. Crude notions of the ideographic nature of the hieroglyphs prevailed till Dr Young, in 1818, first gave out the hypothesis that the hieroglyphs were used as sounds in royal proper names. He was led to this conclusion by tracing the hieroglyphs through the cursive hieratic to the more cursive demotic; and, as this last was known to be alphabetic, he inferred that the corresponding hieroglyphic signs were also alphabetic. In this manner he came to the conclusion that the first hieroglyph in the name of Ptolemy  in the Rosetta Stone (a door) represented a P, the second (hemisphere) a T; the third (a loop) he supposed to be superfluous; the fourth (a lion) he read OLE; the fifth and sixth, the syllable MI; and seventh, the back of a seat, an S. Unaided by bilingual monuments, he essayed to decipher the name of Berenice, and altogether established the value of five hieroglyphs as letters out of two names, but was unable to proceed further. Champollion (q.v.), in 1822, by means of an inscription found on an obelisk at Philæ, which had at the base a Greek inscription, recognised the name of Cleopatra, and by comparison with that of Ptolemy, at once proved the purely alphabetic, not syllabico-alphabetic nature of the signs. Extending the principle, he read by its means the names of the Greek and Roman, and finally those of the native monarchs. It was soon seen that the same hieroglyphs as those employed in these names were extensively used in the texts for words, and these words turned out in most instances to be analogous to the Coptic. Although the discoveries of Champollion were received by many of the learned in Europe with distrust, yet his method of research was slowly adopted by Rosellini and Salvolini in 1832, and subsequently extended methodically by Lepsius in 1837, and by Bunsen, Hincks, De Rouge, Birch, Goodwin, Chabas, Brugsch, and others.

The method of interpretation adopted has been strictly inductive, the value of the characters being deduced from the equation of sounds, or homophones of similar groups. The meaning of the groups or words has been determined by examining all known instances in which they occur in passages capable of being interpreted, that of the ideographs by observing the form of the symbols; many of them have been made out from the pictures which they explain, or the phonetic groups which accompany them. A careful comparison has been instituted with corresponding Coptic forms when they exist. In short, a careful principle of induction has been applied to the study of the hieroglyphs.

The discovery of another trilingual inscription, that of the tablet at San or Tanis, recording a synodical act of the priests in the reign of Ptolemy Euergetes II., 238 B.C., has confirmed the results obtained by Egyptologists, the meaning of almost all the words having been previously determined; while the power of reading all documents and inscriptions afforded by their researches has resulted in the resuscitation of a knowledge of the history, science, and literature of the ancient Egyptians. The study has long passed into the category of a recognised branch of oriental learning, and the researches have assumed a more critical form. This has been owing to the number of students and the abundance of the material which exists. The doubts with which the interpretations were at first received have succumbed to the conviction that nothing but a logical system of interpretation could have obtained such results. Whatever doubt, in fact, may exist as to the minor details and more delicate shades of language, all the grammatical forms and three-fourths of the words of the old Egyptian language have been established.

The hieroglyphs stood in the same relation to the other two forms of the characters, called hieratic and demotic, as type does to handwriting. Their use was chiefly for official inscriptions on public or private monuments, religious formulæ and prayers, and rituals or Hermetic Books (q.v.). The most remarkable hieroglyphic inscriptions are the texts found inscribed upon the pyramids of Pepi, Teta, and Unas; that of Una, recording the conquest of the lands of the negroes at the time of the 6th dynasty; that in honour of Khnumhetp at Benihassan, recording the investiture of his family with the order of the gold collar; the campaigns of Ahmes against the Hykshos at El-Kab; the annals of Thothmes III. at Karnak; the campaign of Rameses II. against the Khita, and the treaty with them; the account of the tanks for gold-washings in the reigns of Seti I. and Rameses II. at Kouban and Redesieh; the invasion of Egypt in the reign of Meneptah by the allied forces of the Libyans and other people of the basin of the Mediterranean; the star-risings on the tomb of Rameses V.; the journey of the ark of Khons to Bakhtan, in the reign of Rameses X.; the account of Cambyses and Darius on the statue of the Vatican; the already-cited synodical act of the priests in honour of Ptolemy Euergetes II.; and that of the priests assembled at Memphis, on the Rosetta Stone, in the reign of Ptolemy V.; the

sepulchral tablets of the family of Pashereniptah, and the long series of sepulchral tablets of the bull Apis found in the Serapeion, recording the birth, installation, and death of the bulls from the 18th dynasty to the Persians.

In connection with the hieroglyphics are two forms of writing them in common use, first the *hieratic* writing, or a cursive form of hieroglyphic. The number of these written characters is fewer than that of the hieroglyphs, the generic determinatives being more employed, and the vocalic complements of the consonants being constantly written in order to distinguish similar forms. This writing was more extensively used than the hieroglyphic, being employed for state papers, legal documents, memoranda, accounts, religious books, rituals, and all the purposes of private and public life. Books were generally written in hieratic. It commences as early as the 4th or 5th dynasty, and terminates only about the 3d or 4th century of our era. At the earliest period it is occasionally written perpendicularly, but it was afterwards only written horizontally, and has generally portions in red ink, corresponding to our initial illuminated letters or rubrics. Many scholars hold it proved that the hieratic alphabet gave rise to the Phœnician, and have traced the Phœnician alphabet from hieratic sources (as in our article ALPHABET, Vol. I., where on page 187 the hieroglyphs, the hieratic characters, and the Phœnician alphabet will be seen side by side). Others still affirm that the precise source of Phœnician writing remains involved in obscurity. The second kind of hieroglyphic handwriting was the *demotic*. It is, like all cursive hands, more difficult to decipher than the hieratic. It was used as far back as the commencement of the 26th dynasty, or the 6th century B.C., and continued in use till the 3d century A.D. This was the last native form of writing in Egypt, the early Christians having introduced the Greek alphabet, with a few characters borrowed from the demotic. This script is rarely used for public monuments, although it appears on the Rosetta Stone; but it was universally employed for contracts, public documents, and occasionally for religious formulæ, owing to the decreasing knowledge of hieroglyphics. At the time of Clement it was the first learned by beginners. With it the Greek language began to appear in public use.

Besides the Egyptian hieroglyphics there are those of the Aztecs or Mexican, which were developed to a stage far above the rude picture-writing of the hunting tribes of American Indians. The system was mainly pictorial, but had made important advances toward attaining phonetic value, especially in the picture-names of persons and places. The simplest kind is where a name meaning 'bird-mountain' is represented by a bird and a mountain; another stage is where a personal name of five syllables is represented by five pictures, each representing a thing whose name corresponds to one syllable of the person's name. After the Spanish conquest, the Franciscans used the Mexican symbols for teaching Christianity. Thus in the Lord's Prayer in Latin, , a flag, pronounced *Pantli*, was used for the syllable *Pa*; , a stone, *Tetl* for *të*, the two expressing *Pater*; , a cactus fruit, *Nochtli*, for *Noch*; and a stone, , as above for *te*: these four groups expressing *Pate*(r) *Nochte*, or *Noster*; and so forth. Some of the missionaries complained of their difficulties when overwhelmed by converted Mexicans giving their confessions written in this puzzling manner. Some have absurdly affirmed, indeed, that all the Mexican manuscripts are monkish impostures. The most important—religious, administrative, historical—are on parchment or on maguey paper. The Toltecan symbols of Central America were different in their method from those of Mexico. —The term hieroglyphic was also used by the writers of emblemata or devices, symbolising Gnomic sentences taken from the Greek and Latin poets, and having no relation to Egyptian hieroglyphs.—In recent times, too, the astrological almanacs have had their symbolical representations and supposed prognostics of future events, which they called hieroglyphs.

Zoëga, *De Origine Obeliscorum* (fo. Rome, 1797); Young, *Archæologia* (1817, vol. xvii. p. 60); *Encyclop. Britannica* (8th ed.); Champollion, *Précis du Système Hiéroglyphique* (1824), *Grammaire Égyptienne* (1841–61), *Dictionnaire* (1841); Lepsius, in the *Ann. del Instituto Arch.* (1828); Birch, *Introduction to the Study of the Hieroglyphics* (1857); Brugsch, *Grammaire Démotique* (Berlin, 1855), *Wörterbuch* (1867–68), *Grammatik* (1872); De Rouge, *Étude d'une Stèle Égyptienne* (1858); Chabas, *Papyrus Magique d'Harris* (1861); *Zeitschrift f. ägypt. Sprache* (1863–74); Bunsen, *Egypt's Place* (vol. v. 1867); Wallis Budge, *First Steps in Egyptian* (1895). For the principal works relating to hieroglyphic literature, see Ibrahim Hilmy, *Bibliography of Egypt and the Soudan* (2 vols. Lond. 1886–87). For American picture-writing and Mexican hieroglyphics, see Schoolcraft's works; Kingsborough, *Mexican Antiquities* (1831–48); E. B. Tylor, *Anahuac* (1861); Im Thurn, *Among the Indians of Guiana* (1883). See also the articles ALPHABET, CHINA, EGYPT, WRITING.

Hieronymites, one of the many hermit orders established in the course of the 13th and 14th centuries. The Hieronymites grew out of the Tertiaries or third order of Franciscans (q.v.). Some of the followers of Thomas of Sienna, one of the Franciscan rigorists, having established themselves in various places among the wild districts which skirt the Sierra Morena in Spain, by degrees formed into a community, and obtained in 1374 the approval of Pope Gregory XI., who confirmed their rule, which was founded on that of St Augustine. The institute extended into other provinces of Spain, into Portugal, later into Italy, Tyrol, and Bavaria.

Hieronymus. See JEROME.

Hierophant, the priest who presided over the mysteries at Eleusis. See MYSTERIES.

Hierosolyma. See JERUSALEM.

Higden, or HIGDON, RALPH, author of the *Polychronicon*, a general chronicle, in 7 books, detailing events from the beginning of the world to the death of Edward III. Higden's own share in the work is believed to extend down to 1326 or 1327 only, the rest having been written by two continuators. Higden himself was a monk of St Werburgh's monastery in Chester; he is said to have lived there sixty-four years, and to have died in 1364. An English translation of the *Polychronicon* by John Trevisa was printed by Caxton in 1482. This and another early translation, with the text, have been edited for the Rolls series (9 vols. 1865–86) by C. Babington (vols. i. ii.) and Professor Lumby (vols. iii.–ix.).

Higgins, MATTHEW JAMES, English essayist, better known by his principal *nom de plume* of 'Jacob Omnium,' was born at Benown, County Meath, Ireland, on 4th December 1810; was educated at Eton and New College, Oxford; and died at Kingston House, near Abingdon, on 14th August 1868. His intellectual force, his humour and irony were enlisted in the warfare against the abuses and backslidings and minor evils of social and public life, such as the heaping up of legal costs as sung by Thackeray. He wrote no great book, but was a steady contributor to a series of journals, such as the *New Monthly Magazine*, *Morning Chronicle*, *Times*, *Cornhill*, *Edinburgh Review*, *Pall Mall Gazette*, &c. He partien-

lady excelled in the implication of the most pungent meaning in a demure simplicity of statement. He was a man of gigantic stature, 6 feet 8 inches high. A few of his sketches were collected by their author, and printed for private circulation in 1857. They appeared again, with others, as *Essays on Social Subjects*, with a Memoir by Sir W. Stirling Maxwell (1875).

Higginson, Thomas Wentworth, an American author, was born at Cambridge, Massachusetts, 22d December 1823, graduated at Harvard in 1841 and at the divinity school in 1847, and was ordained in the same year. He retired from the ministry in 1858. Meanwhile he had been active in the anti-slavery agitation, and, with Theodore Parker, Wendell Phillips, and others, had been indicted for the murder of a man killed during an attempt to rescue a fugitive slave, but escaped through a flaw in the indictment. In the struggle to make Kansas a free state he took a conspicuous part. In the civil war he rose to the command of the first regiment that was raised from among the former slaves. He afterwards returned to literature, and in 1880–81 was a member of the Massachusetts legislature. His books include, besides histories of the United States, a volume of *Harvard Memorial Biographies*, and a translation of Epictetus, *Out-door Papers* (1863); *Malbone, an Oldport Romance* (1869), and *Oldport Days* (1873); *Army Life in a Black Regiment* (1870); *Atlantic Essays* (1871); *Common-Sense about Women* (1881); a Life of Margaret Fuller (1884); *The Monarch of Dreams* (1886); and *Hints on Writing and Speech-making* (1887).

High Commission Court, a court or judicial committee established in 1559 by Queen Elizabeth to investigate ecclesiastical cases, the members being nominated by the crown. In the reign of James I. disputes arose between the common-law courts and the High Commission as to the powers of the latter. In 1611 Coke decided that it had no right to fine or imprison, save in cases of heresy and schism. Laud employed it freely to enforce uniformity and prevent immorality; but the number of clergy punished by it was never great. In two years of its greatest activity only three were deprived and seven suspended. Complaints were made against this extraordinary tribunal, the counterpart for ecclesiastical persons to the Star Chamber for lay offenders, that it exceeded its powers, and was in itself illegal; and it was abolished by the Long Parliament in 1641. A new court of commission for ecclesiastical cases was established by James II. in 1686, only to be abolished by the Bill of Rights (1689). The High Commission Court established in Scotland in 1608 was abolished in 1638.

High Court of Justice. See Appeal, Chancery, Common Law, Judicature Acts.

Highgate, a northern suburb of London, in the county of Middlesex, 4¼ miles NNW of King's Cross Station by rail. Here Bacon and Coleridge died; Whittington's Stone at the foot of Highgate Hill marks the spot where Dick heard Bow Bells, and turned again; Coleridge's remains, buried in the old churchyard, are now covered by the chapel of the Highgate grammar-school; and in the great cemetery (consecrated 1839) have been buried Faraday, Lord Lyndhurst, 'George Eliot,' and many other famous persons.

Highlands, a term applied to the higher parts of a country, as, for example, Highlands of the Hudson, in the state of New York; but commonly used of a particular district in Scotland. This district has no political or civil boundary. Separated by only a vague line of demarcation from the division called the Lowlands, the Scottish Highlands may be briefly described as that portion of the north and north-west of Scotland in which the Celtic language and manners have less or more lingered until modern times. The Highland line, as it is usually called, extends diagonally across the country from Nairn on the Moray Firth to Dumbarton on the Clyde; but the mountainous part of the counties of Banff, Moray, Aberdeen, Kincardine, and Perth are also understood to be included in the designation Highlands. Caithness might be excluded as being a generally level country; but throughout the Highlands there are rich level tracts, none being more so than the eastern division of Ross-shire. The Hebrides (q.v.) or Western Isles are included in the Highlands, but the isles of Orkney and Shetland, though to the north, are distinctly excluded, by reason of the Norwegian origin of the inhabitants.

The Highlands are full of lofty hills, some green and pastoral with tracts of heath, and others rugged and bare; seven reach a height of 4000 feet and upwards, and nearly fifty are between 3500 and 4000 feet. Besides the grander features, there are impetuous mountain-torrents, picturesque ravines, and valleys or glens, lakes of singular beauty, and fiords, or narrow arms of the sea (like the lakes, called *lochs*). Perhaps the most remarkable feature in the country is the line of valleys from Inverness to Fort-William, in which lies a series of navigable lochs, united by artificial channels to form the Caledonian Canal. Growing up under a system of clanship, the state of society in the Highlands was antiquated and alien, from a national point of view; while the country was almost impenetrable to travellers or to any species of traffic. The first great attempt to reform this state of affairs was the opening up of the country by roads in different directions, under the superintendence of General Wade, about 1725–26. The next great act of melioration was the abolition of Heritable Jurisdictions (q.v.), including the ancient privileges of the heads of clans, about 1748. And lastly, not to speak of the planting of schools and churches, much was done by the establishment of the Highland and Agricultural Society in 1784. Since these events the ancient patriarchal system has given place to improvements as regards communication, agriculture, dwellings, education, and other modern conditions, including a gradual substitution of English for the Gaelic language. Great numbers of the Celtic inhabitants emigrated in the last quarter of the 18th century. An enormous increase of population had arisen with no corresponding increase of food. The mountains were practically waste; the discovery that sheep throve upon those natural pastures led of necessity to the letting of them to such tenants as could supply stock. The half-starving people were at various times dispossessed, and their place taken by stock-farmers with capital from the Lowlands; the 'Sutherland clearances,' which have been the subject of so much controversy, took place between 1810 and 1820. While a new character was thus given to extensive Highland pasturages, the value of estates has been very remarkably advanced by being let for the pursuit of game to sportsmen, chiefly persons of rank and opulence from England. What, therefore, with improved farming and shootings, Highland estates have in the 19th century risen immensely in value. Inverness is usually spoken of as the capital of the Highlands.

The physical geography of the Highlands is discussed under Great Britain; see also Scotland. The clan system is treated at Clan, and the language of the Highlands at Gaelic; see also Celts. The condition of the Crofters and the measures taken for ameliorating it form the subject of a separate article; and Deer-forests are treated under that head. See also Agriculture, for

the Highland and Agricultural Society; Hebrides and articles on the several Highland counties and islands; A. Geikie's *Scenery of Scotland* (2d ed. 1887); Dr James Browne's *History of the Highlands and the Highland Clans* (4 vols. 1838; re-edited by J. S. Keltie, 2 vols. 1875); the guide-books by Anderson, Black, Baddeley, Murray; the Duke of Argyll's *Scotland as it was and as it is* (1887).

Highland Costume. There is little doubt about the antiquity of the 'garb of old Gaul,' although several writers have adopted the theory that the kilt was introduced by an Englishman early in the 18th century. The idea that the kilt is modern seems to have originated with a writer in the *Scots Magazine* in 1798. The original dress of the Highlander was the Celtic *Feile-breacan* (or belted plaid). This was a piece of tartan cloth, 2 yards broad and 4 long, which was drawn round the waist in nicely adjusted folds, and tightly buckled with a belt. The lower part came down to the knees in much the same manner as the modern kilt, while the upper part was drawn up and adjusted to the left shoulder, so that the right arm might be perfectly free. This upper part was the plaid, which was used as a covering for the shoulders and body in wet weather; and when the use of both arms was required it was fastened across the breast with a brooch, often curiously enriched. A brooch was also used to fasten the plaid on the left shoulder. To attire himself in the belted plaid required on the part of the Highlander no small amount of dexterity. The usual way was to lay it on the floor, and after carefully arranging the folds, to lie down upon it, and then buckle it on. The late J. F. Campbell of Islay, who had a kilt and plaid in one made for a fancy-ball at Buckingham Palace, had to adopt this plan—lying down on the outstretched cloth, gathering the folds up and round his waist, and then securing them in position by a belt. The lower end was fastened at the right hip. The same arrangement may be seen in a figure by George Jameson of the Earl of Moray engraved in Lord Archibald Campbell's *Records of Argyll*.

The utility of such a dress in the Highlands is obvious, for the plaid rendered the man indifferent to storms, and prepared to pass a night in the open air in the most inclement weather, while the loose undergarment enabled him to wade rivers or ascend mountains with equal ease. It was thus peculiarly adapted to the warrior, the hunter, and the shepherd. If benighted, the Highlander of old would dip his plaid in water, and then wrap it round him, the woollen cloth swollen with moisture being supposed to resist the wind, while the exhalations from the body during sleep surrounded him with a warm vapour. Heron's *History of Scotland* says that 'in Argyle and the Hebridæ, before the middle of the fifteenth century, tartan was manufactured of one or two colours for the poor; more varied for the rich.' The author of *Certayne Matters concerning Scotland*, who wrote prior to 1597, said of the Highlanders that 'they delight in marbled cloths especially that have long stripes of sundrie colours; they love chiefly purple and blue.' The particular *setts*, or patterns of tartans which distinguish each clan, must have been fixed before 1645, probably before 1600. Martin says that every tribe and every island differed from the rest in the fancy of making plaids, as to the stripes in breadth and colours. Tartans may generally be divided into *green* and *red* according as these colours predominate. The word is held by Skeat to be derived from the Fr. *téretaine*, a kind of linsey-woolsey cloth. Lord Lorne in 1889 discovered at Inveraray old records of the clan Campbell which make frequent mention of tartans; and tartans worn at the battle of Kilsyth (1645) have been seen by living witnesses.

The *Feile-breacan* is now abandoned for the *Feile-beag* (*philabeg* or filibeg) as more convenient. The difference is simply this, that, whereas formerly the lower and upper parts of the dress were attached, they are now separated. The lower part has the folds fixed by sewing, and is known as the kilt, which is probably akin to the Danish *kilte*, 'to tuck up,' though the Gaelic *cealt* means apparel in general. The shoulder-plaid, however, is now worn more for ornament than use.

The original garb of the Highlanders, then, was the *Feile-breacan*, and both in its materials and arrangement it was peculiarly the invention of the Gael. Other articles of the costume were Celtic, and are now peculiar to Scotland, but were not distinctively Highland. The *truis* or 'trews' were worn by gentlemen when on horseback, and occasionally by others, especially old men. They were breeches and stockings in one piece, always of tartan, and made to fit very close to the limbs. General Stewart (1822) said that his grandfather always wore the trews on horseback, and the kilt at home. Then there was worn a waistcoat and short-coat, each adorned with silver buttons, and, in the case of gentlemen, with lace and embroidery. A large purse of goats' or badgers' skin was suspended from the belt, and answered the purpose of a pocket. This was the *sporran*, usually ornamented with silver or brass work and tassels. Brogues and tartan stockings, fastened with broad garters in rich colours; a dirk, with a knife and fork, and sometimes a spoon, stuck in the side of the sheath, and a pair of pistols completed the attire. That of the common people differed only in the deficiency of colours and of silver ornaments. The Highland garb was proscribed in 1747, when it was enacted that any person who should wear the plaid, filibeg, trews, or shoulder-belts, tartans or parti-coloured stuffs, should be imprisoned six months for the first offence, and on second conviction be transported for seven years. This harsh law was repealed in 1782 at the instance of the Duke of Montrose. In this act occurs the first formal record of the 'kilt.'

Gentlemen, says Stewart, wore one or more feathers in the bonnet, and the common people a tuft of heather, pine, holly, or oak. All, however, had the right to a solitary eagle's plume, whereas only the son of a chief could wear two plumes, and a chief of a clan, three. This was the old clan rule.

The plumed bonnet of the Highland regiments, according to Lord Archibald Campbell, who headed the successful opposition to its proposed abolition (1884), is an adaptation from the knights of mediæval Europe. On the island of Inishail, Loch Awe, there is on a tombstone (of 16th century) a figure, with long sweeping ostrich plumes such as those worn by German knights in Dürer's drawings. Similar plumes were also worn by the Earl of Moray in Charles II.'s time, and there are also examples of it in *The Black Book of Taymouth*. Logan says that the Highland soldiers wore short plumes at the side of the bonnet. The head-dress of the first Highland infantry regiment raised was a simple black cap, with a tuft of feathers added in token of gentility and the right to bear arms. From this the feather-bonnet seems to have gradually developed, and is now one of the most cherished distinctions of the Highland regiments. When in 1884 the War Office proposed to abolish it there was quite a storm of indignation aroused, and testimony was produced in abundance that as a military headgear it is light, cool, durable, more serviceable, more economical, and more picturesque than the 'bearskin' of the Guards.

The 'modern' fashion of the kilt (filibeg) is found in armorial bearings of the Burnetts of Leys (1626) and the Mackenzies of Coul (1693). Tartan, as a distinguishing clan-mark, seems to be a survival of totemism. It was so composed that a man could tell to what district, as well as to what clan, the wearer belonged.

See Sketches of the Character, Manners, and Present State of the Highlanders, by Major-general David Stewart. For details of the costume, &c. of the Highlanders, see *The Scottish Gael*, by James Logan; Campbell of Islay's *Tales of the West Highlands*; *The Highlanders of Scotland*, by W. F. Skene; *History of the Highlands, Highland Clans, &c.*, edited by J. S. Keltie; *The Black Book of Taymouth*; *Clan Tartans*, by James Grant (1886), &c. In *The Records of Argyll* and *Waifs and Strays of Celtic Tradition* Lord Archibald Campbell has collected an immense amount of interesting and valuable information bearing upon the whole subject.

HIGHLAND REGIMENTS. The origin of the first of these regiments, the 42d, has been given under the head BLACK WATCH. The valuable services of this regiment encouraged the government to augment the force; and accordingly seven other Highland regiments were soon raised—viz. the 71st in 1777; the 72d, or Duke of Albany's Own, in the same year; the 74th in 1787; the 78th, or Ross-shire Buffs, in 1793; the 79th, or Cameron Highlanders, in 1805; the 92d, or Gordon Highlanders, in 1796; and the 93d, or Sutherland Highlanders, in 1800. In connection with the territorial reorganisation of regiments, the old numerical designations have been dropped, and the battalions linked. Thus the new Black Watch (Royal Highlanders) comprises the former 42d and 73d regiments; the Highland Light Infantry, 71st and 74th; the Seaforth Highlanders, 72d and 78th; the Gordon Highlanders, 75th and 92d; Princess Louise's (Argyll and Sutherland Highlanders), 91st and 93d. The Queen's Own Cameron Highlanders (79th) remain a single battalion regiment. The uniform is the Highland dress, with feather-bonnet. A large proportion of the officers are Scotch; of the men about 79 per cent. are Scotch, 11 English, and 10 Irish.

Highness, a title of honour given to princes, grand dukes, and minor reigning potentates. The title 'Highness' and sometimes 'Kingly Highness' were both used in England for the sovereign until the reign of Henry VIII., when they were superseded by 'Majesty.' The children of emperors are usually addressed as 'Your Imperial Highness,' of kings as 'Your Royal Highness,' whilst members of princely families have the titles of 'Serene Highness' and 'Highness.'

High-priest, the chief of the Jewish priesthood, the dignity being hereditary in the line of Eleazar, the son of Aaron. The high priest was only allowed to marry a virgin, and one who was of his own tribe. Contact with anything unclean, even the dead bodies of his own parents, was strictly forbidden to him. His functions consisted principally in the general administration of the sanctuary and of all that belonged to the sacred service. He alone was allowed to enter the Holy of Holies on the Day of Atonement, and to consult by the Urim and Thummim (q.v.). His costume was of surpassing splendour, purple-red, purple-blue, scarlet, golden, and white being the predominating colours of the ephod, girdle, and breastplate, which he wore above robes of pure whiteness. His revenues were in the main the same as those of the other priests; but, according to the Talmud, he was to be richer than these in virtue of his exalted position, and, if his own means were insufficient, he was to be provided with means by his brethren. This points, however, to post-exilic times, when the high-priest had exchanged his character of *primus inter pares* for that of priestly head of the nation, thereby becoming invested, in so far as the political subjection of the Jews to a foreign power would admit of it, with the prerogatives of ancient kingly power. Nevertheless, in the eyes of the law, the high-priest was only the equal of other Israelites. It is doubtful at what time the office of *Sagan*, or vice high priest, was created. See PRIEST.

High Seas, the open sea, including the whole extent of sea so far as it is not the exclusive property of any particular country. The rule of international law is that every country bordering on the sea has the exclusive sovereignty over such sea to the extent of three miles from its shores; but all beyond, not within three miles of some other country, is open or common to all countries. The part of sea within three miles' distance is generally called the territorial sea of the particular country, or *mare clausum*. The distinction has little effect on the right of navigation, but as regards fishing it is otherwise. Thus, foreign fishermen have no right to fish within three miles of the British coast without a license from the crown, or unless some special treaty has laid down other arrangements. See FISHERIES, COOPERAGE.

High Steward, a title given to several important officers. The peer appointed by the crown to preside at the trial of a peer or peeress for treason or felony is called the Lord High Steward; and there is a permanent officer of the royal household who bears the same designation. The universities of Oxford and Cambridge have each a high-steward, whose duty it is to assert and protect the privileges of the university courts.

High-treason. See TREASON.

Highway, in Law. See ROADS.

Highwaymen, robbers who attack passengers on the public road; those who rob on foot being further distinguished as footpads. Famous English highwaymen were Claude Duval (1643–70), Swift Nick Nevison (hanged at York in 1684), Dick Turpin (1705–39) and his comrade Tom King, and Jerry Abershaw (1773–95). Turpin's famous ride to York is a myth, based on a story told of Nevison, whose fame has even gained him a place in Macaulay's *History of England*. The best known romances of the road are W. H. Ainsworth's *Rookwood* and Lord Lytton's *Paul Clifford*. There are lists of books bearing on highwaymen in *Notes and Queries*, 5th series, vol. viii.; and biographical notices of most knights of the road ultimately came to appear in the pages of the *Newgate Calendar*.

High Wycombe. See WYCOMBE.

Hilarion, founder of the monastic system in Palestine, was born, according to the account of Jerome (which is adjudged by modern criticism to be no longer historical), at Tabatha, about 290, educated at Alexandria, and converted to the monastic system by St Anthony. He then lived as a hermit in the desert between Gaza and Egypt for many years, and finally died in Cyprus in 372. His memory is celebrated on 21st October.

Hilary, ST, Bishop of Poitiers, although by no means among the most voluminous of the Latin Fathers, yet, from the nature of the subjects on which he wrote, chiefly connected with the Arian controversy, occupies an important place in the patristic literature of the Western Church. He was born of pagan parents at Limonum (Poitiers) in the early part of the 4th century. His conversion to Christianity was mainly the result of his own study of the prophecies, and did not take place till he was advanced in life. About the year 350 he was elected bishop of his native city, and immediately rose to the first place in the animated contest of parties in the Arian controversy. Having

provoked the displeasure of the court party, he was imprisoned, and sent into exile in Phrygia: but he appears again in the Council of Seleucia in 359, and soon afterwards was permitted to resume possession of his see, where he died in 367. The church holds his day on the 13th January. His most important work is that on the Trinity, but his three addresses to the Emperor Constantius, by their vehemence, and by the boldness of their language, have most attracted the notice of critics. Hilary's theological writings are especially valuable for the history of the Arian party, and particularly for the doctrinal variations of that sect, and the successive phases through which it passed between the Council of Nice and the first Council of Constantinople. He is often styled 'Malleus Arianorum,' and the 'Athanasius of the West,' and was formally recognised as 'universæ ecclesiæ doctor' by Pius IX. in 1851. The most celebrated of the hymns attributed to him is the 'Beata nobis gaudia Anni reduxit orbita,' which was early inserted in western liturgies. The English Hilary term begins on the 11th and ends on 31st January.

See two German Lives by Reinkens (1864) and Baltzer (1881); also J. G. Cazenove's *Saint Hilary of Poitiers and Saint Martin of Tours* in the series of 'Fathers for English Readers' (1883). The best edition of the works of St Hilary is that of the Benedictine Dom. Coutant (Paris, 1693; new ed. 1844–45).

Hilary of Arles, St, was born about 403, educated at the celebrated monastic school of Lerins, and made bishop of his native city in 429. As metropolitan of Arles (*Arelate*) he presided at several synods, and especially at Orange in 441, the proceedings of which involved him in a serious controversy with the pope, Leo the Great. A deposed bishop, named Chelidonius, having carried an appeal to Rome, a council was summoned by Pope Leo, at which Hilary was present, and in which the condemnation of Chelidonius, as well as that of another bishop, Projectus, was reversed. Hilary, however, refused to submit to the decision, and soon afterwards quitted Rome—a proceeding which drew upon himself a very severe animadversion. He did not question the authority in itself, but he maintained that it was uncanonically exercised. In the end, however, he sought a reconciliation with Pope Leo, and the dispute was brought to an amicable termination. Hilary died at Arles in 449, and was canonised, his day being the 5th May.

Hilda, St, the patroness of Whitby, was daughter of Hereric, a nephew of Edwin of Northumbria, and was baptised at fourteen by Paulinus. Recalled by Bishop Aidan from her retreat in a French monastery, she became abbess of Heorta or Hartlepool in 649. In the year 657 she founded the famous monastery at Streoneshalh or Whitby, a double house for nuns and monks, over which she ruled with remarkable wisdom for twenty-two years, dying in 680. Scott's *Marmion* commemorates the belief that the fossil ammonites found here were snakes 'changed into a coil of stone' by Hilda's prayers. Her effigy still stands on the ancient seal of Hartlepool, and churches preserve her name both there and at South Shields.

Hildburghausen. See Saxe-Meiningen.

Hildebrand. See Gregory VII.

Hilden, a town of Rhenish Prussia, 8 miles SE. from Düsseldorf, has woollen, silk, velvet, and carpet manufactures, calico-printing, and machine-shops. Pop. 7946.

Hildesheim, a town in the Prussian province of Hanover, stands on a feeder of the Weser, 24 miles by rail SSE. of Hanover. It is to a large extent an antique town, with narrow streets, high-gabled houses (ornamented with bay-windows and carved woodwork), and many towers. The churches are the most notable buildings, and first amongst them stands the cathedral, dating from the 11th century. It is especially interesting for its antiquarian and artistic treasures, as the bronze gates (1015) with bas-reliefs, the church utensils, the so-called Irmin (q.v.) pillar, a rose-tree said to be a thousand years old, the brazen Christ pillar (1022), the carillon, &c. The St Godehard Church (1133–72) and St Michael's are splendid examples of Romanesque architecture. The so-called Templar House, the town-house (*circa* 1440), and certain antique private houses are interesting buildings. Pop. (1880) 25,887; (1890) 33,481. A bishop's see since 822, Hildesheim first came to Prussia in 1803, and finally in 1866. In 1868 a very valuable find of Roman silver ware was made near Hildesheim. See works by Lüntzel (1858), Wachsmuth (1863), Lachner (1882), and Cuno (1886).

Hilgenfeld, Adolf, theologian, was born 2d June 1823, at Stappenbeck near Salzwedel, studied at Halle and Berlin, and settled at Jena as professor of Theology (1850), representing the liberal school. Among his works are books on the Clementines, the Gospel of Mark, the Epistle to the Galatians, the Apostolic Fathers (1853), the Gospels (1854), *Das Urchristenthum* (1855), the Jewish Apocalyptic Writings (1857), Ezra and Daniel (1863), *Novum Testamentum extra Canonem receptum* (4 parts, 1866; 2d edition, 1876–84), *Messias Judæorum* (1869), *Hermas* (1873), an Introduction to the New Testament (1875), and the *Ketzergeschichte des Urchristenthums* (1884). Since 1858 he has edited the *Zeitschrift fur wissenschaftliche Theologie*.

Hill, Octavia, improver of working-men's houses, was the grand-daughter of Dr Southwood Smith, a well-known sanitary reformer, and was born about 1838. She laboured amongst the London poor under Frederick D. Maurice; and in 1864, supported by Mr Ruskin, she commenced her great work of improving the homes of working-men in the slums and dismal alleys of the metropolis. The plans she adopted were based upon the principle of teaching the people to help themselves, by inculcating in them proper notions of cleanliness, order, and self-respect. Her efforts have been crowned with singular success; the houses which have been improved yield a good percentage on the money spent in effecting the improvements; and hundreds of people have been helped to lead more comfortable and better lives. Miss Hill has written *Homes of the London Poor* (1875), *Our Common Land and other Essays* (1878), and papers in the magazines.

Hill, Rev. Rowland, a popular but eccentric preacher, was born 12th August 1744, at Hawkeston, the sixth son of a Shropshire baronet. Whilst a student of St John's College, Cambridge, he fell under the influence of Whitefield, the Methodist preacher, and at once began to tread in his footsteps. All his life through Hill retained his passion for open-air preaching: and the first ten years after his ordination were spent in itinerant preaching throughout England. But having built for himself Surrey Chapel in Blackfriars Road, London, in 1783, he regularly preached there to his life's end; and, although a Dissenter, he used the services, and regarded himself as a member of the Church of England, of which he had indeed been ordained a deacon. It is said that the 'first Sunday-school in the metropolis was established by Rowland Hill soon after the opening of Surrey Chapel.' He died on 11th April 1833. Rowland Hill was undoubtedly eloquent and possessed a rich fund of genuine humour, but at times his manner verged upon buffoonery. His *Village Dialogues* (1801; 34th

ed. 1839; latest ed. 1871) has been sold in large numbers. Besides this he wrote several pamphlets, as *Imposture Detected* (1777), *Aphoristic Observations* (1790), *Spiritual Characteristics* (1803; 3d ed. 1860), some volumes of *Sermons*, *Hymns*, and other works. See Lives by Sidney (1834), W. Jones (1834), Sherman (1857), Broome (1881), and Charlesworth (1876; 2d ed. 1886).

Hill, Rowland, Viscount Hill, was son of Sir John Hill of Hawkestone and nephew of the preceding, and was born at Prees Hall, in Shropshire, August 11, 1772. Entering the army at fifteen, he became captain at twenty, commanded the 90th regiment in Sir Ralph Abercromby's Egyptian expedition, and was gazetted brigadier-general in 1803. He accompanied Sir Arthur Wellesley to Spain in 1808, and was his right arm throughout the whole Peninsular war. His conduct and courage earned him a C.B. in 1811, and three years later he was made Baron Hill of Almarez for his capture of the forts of Almarez. At Waterloo he led the brigade which swept the Old Guard from the field, and he remained with the army of occupation as second in command until it evacuated the French territory. He succeeded Wellington as commander-in-chief of the army in 1828, but resigned in 1842, when he was made Viscount Hill. He died unmarried at Hardwicke Grange, Shropshire, December 10, 1842, and was succeeded in his titles and estates by his nephew Sir Rowland Hill, Bart. See his Life by the Rev. Edwin Sidney (1845).

Hill, Sir Rowland, K.C.B., originator of the uniform penny postage system and reformer of the post office, was born at Kidderminster on 3d December 1795. From a very early age down to 1833 he taught in his father's school—from 1819 in Hazlewood, near Birmingham, a school-house built by himself, and afterwards at Bruce Castle, Tottenham. Rowland was always of an inquiring and ambitious turn of mind, with a decided talent for initiating reforms. At first he busied himself with mechanical and other inventions, later in life with questions of public concern. In 1826 he was one of the founders of the Society for the Diffusion of Useful Knowledge. After he had ceased to teach, he took an interest in the socialistic schemes that were being discussed and experimented with about that time, especially by Robert Owen. Then his restless mind led him to take an active share in the colonisation of South Australia, under Wakefield's system of colonising. Amongst other things his attention had been drawn at different periods to postal questions; and he became sensible that there existed an urgent need for a diminution in the high rates of postage, which practically excluded all but the wealthy from postal intercourse. His views on the subject, advocating a low and uniform rate of postage, to be prepaid by stamps, between all places in the British Isles irrespective of distance, were published in the form of a pamphlet, *Post-office Reform*, in 1837. His plan was eagerly taken up by Mr Robert Wallace, M.P. for Greenock, who gave essential help in fighting the case through parliament. Two years later Hill was attached to the Treasury for the purpose of putting his projected reforms into execution; and on 10th January 1840 the present uniform penny rate came into force. On 6th May following stamped envelopes and adhesive stamps were issued to the public, but the preference for the latter was soon made manifest. In 1841 the Conservative government, which had consistently opposed the reduction of postage, came into office, and in the following year, through the influence of certain government officials who strongly resented all innovations, Rowland Hill was dismissed from his position. Four years later a sum of £13,000, raised by public subscription, was presented to him as a token of public esteem to a national benefactor. In the same year the Liberals returned to power, and Hill was appointed secretary to the Postmaster-general. This office was exchanged in 1854 for that of secretary to the post-office. In 1864 he was compelled to resign owing to ill-health, and was then awarded a pension of £2000 for life, together with a parliamentary grant of £20,000. The effect of his reforms in the United Kingdom has been to raise the number of inland letters from about 77 millions annually to about 1900 millions, or about twenty-five fold, and it may be stated generally that the main principles of his plan have now been adopted in every civilised country throughout the world. Sir Rowland Hill was made a Knight Commander of the Bath in 1860. He died at Hampstead on 27th August 1879, and was buried in Westminster Abbey. Amongst the other improvements and reforms he effected in the post-office system must be mentioned the establishment of the book-post (1848), the reform of the money-order office (1848), and of the packet service, and a multitude of minor improvements affecting the administration of the postal service. See the article Post-office; Sir Rowland Hill's book, *The State and Prospects of Penny Postage* (1844); and the Life (1880), by his nephew G. B. Hill, which includes Sir Rowland Hill's *History of the Penny Postage*.—His eldest brother, Matthew Davenport Hill (1792–1872), recorder of Birmingham from 1839 to 1866, distinguished himself by his labours for education and the reformation of criminals. See Memoir by his daughters (1878).

Hillah, or Hilla, a town of Turkey in Asia, on the river Euphrates, 60 miles S. of Bagdad, on the site of Babylon, out of the ruins of which it was built about 1100 A.D. Tanning and the manufacture of silk, cottons, and woollens are carried on. The population fluctuates between 7000 and 15,000.

Hillel, called Hababli ('the Babylonian') and Hazaken ('the Elder'), one of the greatest and most influential doctors of the Jewish law, was born about 60 B.C. in Babylonia, of poor parents, but in the female line of royal (Davidian) descent. When forty years old—so runs the Talmudic account—he migrated into Palestine for the purpose of studying the law under Shemaia and Abtalion, the great masters of the period. Five or six years after Herod had mounted the throne Hillel was elected president of the sanhedrim. The range of his acquirements is said to have been immense, embracing not only Scripture and tradition, but nearly all branches of human and superhuman knowledge. Yet he was one of the meekest, most modest, kind, and simple-hearted men. Hillel was the first who collected the numberless traditions of the oral law, and arranged them under six heads (see Mishna). Between him and his contemporary Shammai and their respective followers there arose a spirit of keen rivalry, the latter being advocates of greater strictness and rigour in the interpretation of the law. Hillel died about 10 A.D. His doctrine has often been compared with the early teaching of Jesus. See Delitzsch's *Jesus und Hillel* (3d ed. 1879).

Hiller, Ferdinand, pianist, musical composer, and writer on music, was born at Frankfort-on-Main on 24th October 1811. Having been a pupil of Hummel, he began to teach in his native town; but from 1829 to 1836 he laboured in Paris. The next nine years he spent partly in Italy, partly in Germany; it was during this period that he produced his best work, the oratorio *Die Zerstorung von Jerusalem* (1839). Then, after three years

service as municipal music-director in Düsseldorf (1847–50), he proceeded to Cologne, where he filled a similar post until his death, 10th May 1885. Amongst nearly 200 musical works which he published only a small number have retained their footing. But as a writer on musical subjects Hiller claims a higher place. His *Uebungen zum Studium der Harmonie und des Kontrapunktes* (12th ed. 1886) is extensively used; and there is much valuable criticism in *Aus dem Tonleben unserer Zeit* (1868–71), monographs on Beethoven (1871) and Mendelssohn (1874; 2d ed. 1878), *Musikalisches und Persönliches* (1876), *Briefe an eine Ungenannte* (1877), *Künstlerleben* (1880), and *Erinnerungsblätter* (1884).

Hillern, Wilhelmine. See Birch-Pfeiffer.

Hill-forts, the refuges and strongholds of the early inhabitants, exist in every country of Europe. Their range in time extends from the early prehistoric through the early historic periods of the racial areas in which they are found. They have no more definite form than that of a prevailing but irregular circularity. The site selected is usually enclosed and fortified with due regard to its specialties of situation and defensibility. Sometimes the fort instead of occupying the whole hill-top may occupy only the most defensible part of it. In other cases the whole eminence may be surrounded by defensive constructions completely encircling and protecting its upper portion. Occasionally these forts, though situated among the hills, are planted in the lower ground, commanding an extent of meadow-land or pasture. With regard to their construction, the hill-forts are usually either earthworks or stoneworks, rarely a mixture of both. In France the Gaulish forts of the pre-Roman period were often such extensive works as to be termed *oppida* by the invading Romans. Though built of dry-stone masonry, the parts of the walls most exposed to attack were bound together by great logs of wood, placed both longitudinally and transversely within the thickness of the rampart, so as to resist as much as possible the assaults of the battering-ram. The great dry-built stone rampart of the prehistoric fort at Burghead, in Elginshire, is similarly strengthened by logs of oak, but it is the only example of this method of construction yet known in Scotland, where hill-forts are perhaps more numerous than in any other European country. They are generally called 'duns' (see Dun) in the northern and 'camps' in the southern districts, where the older term survives in connection with a number of the principal forts, as Dumbarton (*Dun Bhreatan*), Dundonald in Ayrshire, and Dunpelder in Lothian, not to mention Dun Edin as the old name of Edinburgh. Among the most remarkable of the hill-forts of Scotland may be mentioned those of the two Caterthuns in Forfarshire—one a good example of the fort with earthen rampart, and the other with walls of dry stone—the Tap o' Noth, and the twin-summits of Benachie, each with its massive fortifications of stone, in Aberdeenshire, the remarkable stone fort of Dun Tuathal on Drummond Hill, overlooking the junction of the waters of the Lyon and the Tay, and one equally remarkable, called Dun-dalamh, in a similar situation in Laggan on the Spey, Inverness-shire.

Many of the dry-stone forts in Scotland present the peculiar feature of a partial vitrifaction of the materials of their walls. The same thing has been observed in connection with similar forts in Ireland, France, and Hungary. The attempt to account for the existence of this peculiarity has given rise to much speculation and controversy. But it seems to be clearly established that the so-called vitrified forts do not differ from the other dry-stone forts, if the vitrifaction be not regarded as a process of construction. No relevant and conclusive evidence on this point has been obtained from examination of the structures themselves; and against the arguments in support of the view that the vitrifaction was intended as a cementing process we have to put the facts (1) that no fort is wholly vitrified; (2) that where vitrifaction exists it occurs in patches, affecting sometimes a portion only of the thickness of the wall; and (3) that when it occurs on the exterior surface of the wall the upper parts are sometimes found partially vitrified, but with no trace of vitrifaction on the portions underneath. Among the best known of the so-called vitrified forts in Scotland are the Tap o' Noth in Aberdeenshire, Craig Phadric and Dunbhairdgall in Inverness-shire, Knockfarril in Ross-shire, Dun Mac Uisneachan in Argyllshire, and Finhaven in Forfarshire. In Wales stone forts are most numerous, while in England earthworks predominate. The earthen forts of Sussex explored by Colonel Lane Fox are sometimes of considerable magnitude, that of Cissbury, for instance, enclosing a space of 60 acres. They are, as a rule, of prehistoric origin. Some of the stone forts of Ireland, especially those of the Aran Isles, are of great magnitude and well preserved. Photographic views of them are given in Lord Dunraven's book on Early Irish Architecture.

Consult also Dr Christison's 'Prehistoric Forts of Peeblesshire,' and 'The Duns and Forts of Lorne' in the *Proceedings of the Society of Antiquaries of Scotland* (vols. xxi. and xxiii.); 'Mémoires sur les Ouvrages de Fortifications Gauloises,' &c. in the *Compte Rendu du Congrès Archæologique de France*, at Toulouse in 1874 (p. 427); 'Les Camps Barbares fortifiés en Hongrie,' by F. F. Romer, in the *Compte Rendu* of the Congress of Prehistoric Archæology held at Budapest in 1876 (vol. ii. p. 68); and 'Helvetische Denkmaler,' by Dr F. Keller, in *Mittheilungen der Antiquarischen Gesellschaft in Zurich* (vol. xvi.).

Hill Mustard. See Bunias.

Hilversum, a village in North Holland, 18 miles by rail SE. from Amsterdam, manufactures woollens and carpets. Pop. (1889) 12,199.

Himalaya (properly *Himálaya*; from two Sanskrit words meaning 'snow-abode') is, strictly speaking, the southern escarpment of the great Central-Asian plateau in so far as it falls between the Indus and the Brahmaputra. Thus limited, it extends from 73° to 95° E. long., over a distance of some 1500 miles. The Himalayas are not a single range, but a system of for the most part parallel ranges lying obliquely to the general direction of the system. They front the plain of the Ganges in northern India like a stupendous mountain wall, bending back in the west like a scimitar, the sharp edge turned next India. On the east the system is connected with the mountain-ranges of south-west China and northern Burma and Siam. On the north it is backed by the lofty plateau of Tibet, which ranges in elevation from 10,000 to 17,000 feet. At its north-western extremity it runs up into the Pamir plateau, from which radiate also the Hindu-Kush and the Kuen-Lun Mountains. The southern foot of the system rests upon the plain of the Ganges, which nowhere rises more than 1000 feet above the level of the sea. The edge of the outermost hills is skirted, for a distance varying in width from 10 to 15 miles, by a belt of swampy grass-land, traversed by numerous sluggish streams. These in many places overflow and form standing swamps, fringed with gigantic reeds. This belt, called the Tarai, does not extend west of the point where the Ganges breaks through from the mountains. These districts, owing to the great quantity of stagnant water and the great profusion of rank vegetation, are extremely unhealthy; many parts reek with

fevers of a very malignant type. Next above the Tarai lies a belt of forest of about the same width, called the Bhabar. Its soil consists of sand, liberally strewn with shingle beds and boulders. The waters of the minor streams that come down from the higher mountains are generally absorbed by this spongy talus-slope, and, passing through it underneath the surface, accumulate again on the upper edge of the lower-lying Tarai.

Above the Bhabar rise the foot hills of the Himalayan system, generally designated the Siwalik Hills, or sub Himalayan ranges. They vary in height from a few hundred feet up to 4000, and present steep faces to the plains; on the northern side the slope is gentler, being mostly met at short distances from the summit by the southern flanks of the inner ranges. Geologically the Siwalik Hills belong to the Tertiary formation, and to the Pliocene rather than to the Miocene period. From the ranges near the Jumna great quantities of fossils, mostly mammals and reptiles, all land and fresh-water animals, have been obtained. It is on the north side of the Siwalik foot-hills that the first mountains appear. They rise up abruptly to elevations ranging for the most part from 7000 to 10,000 feet, and cover a surface zone of 50 miles in breadth. This division embraces a large number of irregular ridges, characterised by great complexity of geological structure. They yield marine fossils. On these ranges stand the sanatoriums, such as Simla, Darjiling, Almora, &c., which are so essential to Europeans during the hot months. The space between the outer members of these ranges and the Siwalik foot-hills is occupied by narrow, shallow, longitudinal valleys, called Dun in the west and Mari in Nepal. They are partly covered with loose shingle and boulders, partly worn into terrace-like steps, partly broken by low, obliquely lying, watershed ridges, which throw off numerous small streams.

In the Himalayas proper two main axes can be determined with tolerable distinctness. One, the southern, contains the line of the great snowy peaks; the other, the northern, forms the watershed between the rivers of India and the rivers of Tibet. The mountains in the southern chain are amongst the loftiest in the world; a very great number of them exceed 20,000 feet (3¾ miles) in height. One of these, Mount Everest (29,002 feet), is the highest measured mountain in the world. Other lofty peaks in this division of the Himalayan system are Mount Godwin-Austen (28,265), the second highest in the range; Kinchinjinga (28,156); Dhawalagiri (26,286); Nanda Devi (25,700); Trisul (23,400), and several others more than 22,000 feet in altitude. The chain of great snowy peaks is, strictly speaking, a series of mountain-groups, each of which is connected with the watershed chain to the north by a transverse ridge, covered with snow and frequently bearing on its shoulders peaks that tower up to the height of 25,000 feet. Graham, who in 1883 ascended Kabru to a height of 23,700 feet, believed that there are other peaks which will be found to exceed Mount Everest in altitude, for the central parts of the system next Tibet have not yet been surveyed or even explored with anything approaching to thoroughness, mainly because of the jealousy and exclusiveness of the Tibetan authorities, within whose territory much of the loftiest region of the Himalayas falls. These transverse spurs from the northern chain, terminating in stupendous mountain knots, form deep valleys on either side in the space between the two chains. These deep valleys, fringed with overhanging glaciers, are the cradles of the great rivers of northern India. Here are the sources of the Ganges and the Indus and the Brahmaputra, and of hundreds of rivers and streams whose waters eventually reach the ocean through the mouths of these three great channels. The rivers of the Himalayas mostly make their way through the mountains at the bottom of wild and narrow gorges, often several thousands of feet deep, the path through the various chains being mostly at right angles to the strike of the ridge. The inclination of the rivers is, however, nowhere very steep, except along one line: about ten miles south of the chain of great peaks the rivers descend about 5000 feet in the course of a few miles.

This indicates that the whole region must at one time have been bodily upheaved, and before the period of upheaval there existed here a natural ridge or fold of the earth. Geologists indeed believe that the entire site of the Himalayan system, taken in its widest extent, in which it embraces the whole of the Tibetan plateau as far as the outer Kuen-Lun Mountains, was in distant geologic ages the bed of a vast sea or ocean. The mountains are believed to be the result of the action of mechanical forces, such as horizontal compression and tension, combined with lateral stress and strain, operating upon the cooling crust of the earth in a region where, owing to the recent evaporation of the ocean, it was softest and most pliable, and therefore offered least resistance. The rocks of this part of the system are principally crystalline gneiss and mica schist, with veins and zones of granite intruding. The snowy region of the Himalayas is plentifully studded with glaciers, some of them of great extent: one has been surveyed in the western part of the system 36 miles in length. In the same region they descend to 11,000 and 12,000 feet, in the eastern part of the system not lower than 13,000 and 14,000 feet; and on the Tibetan side they are seldom found to come lower than 15,000 and 16,000 feet. This difference is partly due to the difference between the angles of declivity on the north and on the south sides of the chief ranges, partly also to differences in climatic conditions, the principal being the heavier snowfall and the greater rainfall which take place on the south, and the greater dryness of the atmosphere on the Tibetan plateau. Conformably with these facts, the snow-line ranges higher on the Tibetan side than on the Indian: whereas, on the watershed chain, it seldom descends lower than 18,000 feet, and on the tableland remains at 20,000, on the southern faces of the mountains it runs at 15,000 or 16,000 feet. The watershed chain has been little explored; it lies chiefly within Tibetan territory. The only exception to the former statement occurs on the west, where the Mustagh range, which is crossed by the pass of Karakoram (18,350), towers above the mountain valley of Kashmir, forming its northern wall, as the Pir-panjal, a range of the outer Himalaya division rising to 14,000 or 15,000 feet, shuts it in on the south. This watershed chain forms an almost continuous line of peaks, its crest being probably over 18,000 feet in elevation. So far as is known, it is only broken by one pass of less altitude than 16,000 feet, namely the Dras pass leading from Kashmir, which is 11,300 feet above sea-level. The Niti Pass (16,676), south-east of Ladak, connects the best roads from India and from East Turkestan.

The Himalayas possess few lakes. In the east, north of Sikkim, are Yamdok-cho or Palti, 45 miles in circumference, with an island, 2000 to 3000 feet high, in the centre; and Chomto-dong, 20 miles long by 16 broad, at an altitude of 14,700 feet. More to the west lie the holy Tibetan lakes of Manasarowar and Rakas Tal, which give birth to the river Sutlej. Besides these there are Nainital in Kumaon and the Lake of Kashmir. In nearly all parts of the Himalayas metallic ores

have been ascertained to exist. But gold, iron, copper, and lead are the only minerals extracted. Gold is largely mined in Tibet; copper and iron ore are worked in Kumaon and Garwhal.

In the lower, hotter, and moister parts of the Himalayas, chiefly towards the east, the flora is closely related to that of the Malay Peninsula and islands. Farther west, as the drier, colder parts are approached, it approximates to the European flora. On the lower ranges the chief vegetative forms are sals, sissus, bamboos, palms, acacias, rhododendrons, ferns, orchids, &c. in the east, and oaks, pines, spruces, firs, cedars, deodars, and others in the west. On the highest ranges the principal trees are conifers and poplars, with a great variety of alpine plants. The European beech does not grow on the Himalayas. Cultivation does not ascend higher than 7000 feet, except in a few of the warmer valleys. The plants of greatest commercial importance cultivated on the Himalayan slopes are tea and cinchona. In respect of its fauna this region is one of the richest in the world, particularly in birds. Among the more remarkable animals may be mentioned bears, wild cats, leopards, tigers, sun-bears, cat-bears, yaks, musk-deer, wild goats, wild sheep, wild dogs, flying squirrels, the bamboo-rat, and water-shrews. Insects are almost as numerous as birds.

Within Indian territory most of the inhabitants of these mountains are Hindus. The Tibetan portions are occupied by peoples of Turanian stock. No statement can be given of the total number of these mountaineers; many of them live in remote valleys, and are almost unknown, whilst many others dwell outside the limits of the British dominions. In Hindu mythology these majestic mountains are invested with great sanctity. Thousands of pilgrims travel year after year to the holy sources of the Ganges. The temples they visit stand beside the glaciers from which the river emerges, at Gangotri, Kedarnath, and Badrinath. Other temples, scarcely less sacred, stand beside the source of the Jumna at Jamnotri.

See Medlicott and Blanford, *Manual of the Geology of India* (3 vols. Calcutta, 1879); J. D. Hooker, *Himalayan Journals* (2 vols. Lond. 1854); the works of B. H. Hodgson; Godwin-Austen, in *Journ. As. Soc. Bengal* (1867–75) and *Proc. Roy. Geog. Soc.* (1883 and 1884); W. W. Graham, in *Proc. Roy. Geog. Soc.* (1884); Clements Markham, *Bogle in Thibet and Manning in Lhasa* (1876); T. Saunders, in *Geog. Mag.* (1877); Sir H. Strachey, in *Roy. Geog. Soc. Journ.* (vol. xxiii.); *Memoirs of Geological Survey of India*; A. Wilson, *Abode of Snow* (1875); Strachey, *The Himalaya* (1890); and Sir W. M. Conway, *Climbing in the Karakoram Himalayas* (1894).

Him'era, an ancient city on the north coast of Sicily, east of Panormus (*Palermo*), and near the mouth of the river Himera, was a Greek colony established 649 A.D., and destroyed in 409 by the Carthaginians, who afterwards built Thermæ (mod. *Termini*) across the river. Stesichorus was a native of Himera, Agathocles of Thermæ.

Himilco. See CARTHAGE.

Himyaritic, a name formerly in use for the language of the ancient Sabæan inscriptions in the south-west of Arabia. See ARABIAN LANGUAGE, SABEANS, SEMITIC LANGUAGES.

Hinckley, an ancient town of Leicestershire, and partly also of Warwickshire, 13 miles SSW. of Leicester. Its parish church, with a beautiful oak roof, is supposed to have been erected during the reign of Edward III. Hinckley has manufactures of cotton hosiery and of boots and shoes. It stands on the old Watling Street. Pop. (1851) 6111; (1891) 9638.

Hincmar, a celebrated churchman of the 9th century, of the family of the Counts of Toulouse, was born in 806. He was educated in the monastery of St Denis; was named abbot of the abbeys of Compiègne and St Germain; and in 845 was elected Archbishop of Rheims. Rothadius, Bishop of Soissons, and suffragan of Hincmar, deposed a priest of his diocese, who appealed to Hincmar, as metropolitan, and was ordered by him to be restored to office. Rothadius, resisting this order, and having been in consequence excommunicated by the archbishop, appealed to the pope, Nicholas I., in 862, who at once ordered Hincmar to restore Rothadius, or to appear at Rome to vindicate the sentence. Ultimately Nicholas annulled the sentence. Hincmar, after some demur, was forced to acquiesce, and Rothadius was restored to his see. Hincmar wrote much against the strong predestinarian views of the monk Gottschalk, whom he united with others in degrading and imprisoning. Gottschalk died in prison after eighteen years' confinement.

The conduct of Hincmar is also historically interesting in relation to the temporal power of the medieval papacy. Under Adrian II. a question arose as to the succession to the sovereignty of Lorraine on the death of King Lothaire, the pope favouring the pretensions of the Emperor Lewis in opposition to those of Charles the Bold of France. To the mandate which Adrian addressed to the subjects of Charles and to the nobles of Lorraine, accompanied by a menace of the censures of the church, Hincmar offered a firm and persistent opposition. He was equally firm in resisting the undue extension of the royal prerogative in ecclesiastical affairs. When the Emperor Lewis III. sought to obtrude an unworthy favourite upon the see of Beauvais, Hincmar boldly remonstrated, and fearlessly denounced the unjustifiable usurpation. Hincmar died in the year 882.

His works were collected by the Jesuit Sirmond (1645), and are to be found in Migne's *Cursus Patr. Compl.* His *Annales Bertiniani*, from 861 to 882, are in vol. i. of Pertz's *Monumenta*. See Prichard, *Life and Times of Hincmar* (1849), and German works by Noorden (1862), Sdralek (1881), and Schrörs (1884).

Hind, the female of the Stag (q.v.) or Red Deer. The term is also sometimes applied to the female of some other deer—though never to any other British or European species—and is sometimes even extended to female antelopes.

Hind, JOHN RUSSELL, astronomer, was born at Nottingham, May 12, 1823. At an early period he became an enthusiast in the study of astronomy, and in 1840 obtained, through the influence of Professor Wheatstone, a situation in the Royal Observatory at Greenwich, where he remained till June 1844. Hind was then sent as one of the commission appointed to determine the exact longitude of Valentia, and on his return became the observer in Mr Bishop's Observatory, Regent's Park, London. Here he calculated the orbits and declination of more than seventy planets and comets, noted a number of new movable stars, and between 1847 and 1854 discovered ten minor planets (see PLANETOIDS). In 1851 Hind obtained from the Academy of Sciences at Paris their Lalande medal, and was elected a corresponding member; in 1852 he obtained the Astronomical Society of London's gold medal, and a pension of £200 a year from the British government; in 1853 he undertook the editing of the *Nautical Almanac*. Hind's scientific papers were generally published in the *Transactions of the Astronomical Society*, in the *Comptes Rendus* of Paris, and the *Astronomische Nachrichten* of Altona. Amongst his works are *Astronomical Vocabulary* (1852), *The Comets* (1852), *The Solar System* (1852), *Illustrated London Astronomy* (1853), *Elements of Algebra* (1855), and *Descriptive Treatise*

on Comets (1857). For a time president of the Royal Astronomical Society, he died 23d December 1895.

Hindi. Hindustani, Hinduism. See India.

Hindley, a town of Lancashire, 3 miles SE. of Wigan by rail. There are numerous coal works in the vicinity; and the cotton manufacture is largely carried on. Pop. (1851) 5285; (1891) 18,973.

Hindu Kush (the 'Indian Caucasus' of Alexander the Great's historians) forms the westward continuation of the Himalayan system, of which it is sometimes reckoned a part, and from which it is separated by the chasm through which the Indus breaks its way to the plains. It strikes off from the south-west angle of the Pamir plateau, and extends westwards for 365 miles to the Bamian valley in Afghanistan, separating that country on the south from Turkestan on the north. Near its point of origin several rivers take their birth; the Oxus goes off north west through Turkestan, and the Helmund south-west through Afghanistan. The main range breaks into four subsidiary ridges, and has a total width of about 200 miles. Unlike the Himalayas, it sinks suddenly to the plains of Turkestan on the north. It is crossed by several passes, at an average elevation of 12,000 or 13,000 feet. From the Bamian valley the range is continued westwards as a low watershed elevation, known as Koh i Baba. (Koh i Baba is also the name of a peak in the Hindu Kush.) The peak of Hindu Koh, about 80 miles to the north of the city of Kabul, is estimated to be more than 20,000 feet above the sea. The highest point in the range that has been yet measured exceeds 23,000 feet. The flanks of the mountains are mostly barren and destitute of cultivation; but minerals, especially iron, occur in great abundance. The inhabitants consist principally of Dards (see Dardistan) and Shins, the latter the descendants of the original colonists of the country. A loose kind of Mohammedanism is the prevalent form of religion. See J. Biddulph, *Tribes of Hindu Kush* (Calcutta, 1880). Conway ascended Pioneer Peak, 23,000 feet, and saw others higher than Everest. See Himalayas.

Hindustan. See India.

Hinnom, Valley of. See Gehenna.

Hinny, the hybrid produced between a horse and a female ass. It is smaller than a mule, but the body is more bulky in proportion to the legs, and its strength is inferior. It is less valuable than the mule, although it is more docile. The hinny is rare. It was described by some of the earlier naturalists as a hybrid between the ox and the ass.

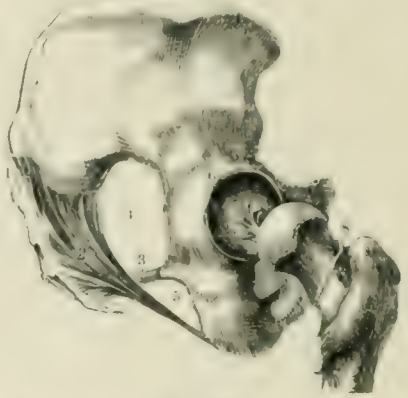
Hinojosa-del-Duque, a town of Spain, 45 miles NNW. of Cordova, with some linen and woollen manufactures. Pop. 9500.

Hinton, James, aurist and metaphysician, was born in 1822, son of a Baptist minister, studied medicine at St Bartholomew's Hospital, and, after much travel, settled about 1850 to a London practice, ultimately becoming a specialist in aural surgery. From 1862 till 1874 he was a lecturer on this department at Guy's Hospital. He died 16th December 1875. In his lifetime he published *Man and his Dwelling place* (1859), *Life in Nature* (1862), and the *Mystery of Pain* (1865); and after his death appeared, with other works, *Philosophy and Religion* (1881) and *The Law-breaker and Coming of the Law* (1884). These books contain striking and suggestive things enough, but their author evidently took himself too seriously as a metaphysician, as has also been done by a handful of disciples. See his *Life and Letters*, by Ellice Hopkins (1878).

Hiogo. See Hyogo.

Hip. See Rose.

Hip-joint is a ball and socket joint formed by the reception of the globular head of the thigh bone (or femur) into the deep pit or cup in the *os innominatum*, which is known as the *acetabulum*. If the variety of the movements of this joint—viz. flexion, extension, abduction, adduction, and rotation inwards and outwards, and at the same time its great strength are considered, it may well claim to be regarded as the most perfect joint in the whole body. The reader will form a tolerably clear conception of the relative forms of the acetabulum and the head of the thigh-bone from a glance at the figure, in which the surrounding parts are cut away, and



Hip-joint:

1, 2, 3, pelvic ligaments; 4, 5, the greater and lesser sacro-ischiatic foramina; 6, the cotyloid ligament; 7, the round ligament; 8, the cut edge of the lower part of the capsular ligament.

the thigh-bone is drawn out of its socket. The ligaments are usually described as five in number—the capsular (consisting of circular and longitudinal fibres, of which the most important are the *ilio-femoral* or Y-shaped band), *teres* or round, cotyloid, and transverse ligaments. Of these the capsular ligament, supposed to be removed in the figure, is the most important, and extends from the edge of the cup to the circumference of the neck upon which the ball is carried, enclosing the bony parts in a strong sheath. The great use of the capsular ligament is to limit the extension of the hip-joint, and thus to give steadiness to the erect posture. The *teres* or round ligament is in reality triangular rather than round, and has its apex attached to the head of the thigh-bone. The joint is much strengthened by a large number of surrounding muscles, some of which are of considerable power. The experiments of Weber show that atmospheric pressure is the real power by which the head of the femur is retained in the acetabulum when the muscles are at rest.

Disease of the Hip Joint. Hip disease differs in many points of importance from other joint-diseases. Its connection with scrofula is more distinctly marked than that of most other joint-diseases, and it almost always occurs before the age of puberty. It comes on, in children or young persons of a scrofulous constitution, from very slight causes; thus, it is often traced to over-exertion in a long walk, a sprain in jumping, or a fall; and in many cases no apparent cause can be assigned. In the early stage of the disease the whole of the structures of the joint are inflamed, and by proper treatment at this period the morbid action may be sometimes subdued without any worse consequences than a more or less rigid joint. Usually, however, abscesses form around the joint, and often communicate with its interior; and the

acetabulum and the head and neck of the thigh-bone become disintegrated, softened, and gritty. In a still more advanced stage dislocation of the head of the thigh-bone commonly occurs, either from the capsular ligament becoming more or less destroyed, and the head of the bone being drawn out of its cavity by the action of the surrounding muscles, or from a fungous mass sprouting up from the bottom of the cavity, and pushing the head of the bone before it. It is of extreme importance that the symptoms should be detected in an early stage of the disease.

As the disease advances abscesses occur around the joint. True shortening of the limb now takes place, which at the same time becomes adducted and inverted. From this stage, if the health is pretty good, and the lungs are sound, the patient may be so fortunate as to recover with an anchylosed (or immovable) hip-joint; but the probability is that exhaustion and hectic will come on, and that death will supervene, from the wasting influence of the purulent discharges occasioned by the diseased bone. The duration of the disease may vary from two or three months to ten or more years.

As the treatment must be left entirely in the hands of the surgeon it is unnecessary to say more than that the most important points are *perfect rest* to the affected part, which may be effected in various ways, the internal administration of cod-liver oil and tonics, and the application of counter-irritation by means of an issue behind the great trochanter.

Hipparchus, the first systematic astronomer on record, was born at Nicæa, in Bithynia, and flourished between 160 and 125 B.C. Of his personal history nothing is known except that he observed at Rhodes. The only authority we have regarding his researches is the *Syntaxis* of Ptolemy; from it we learn that Hipparchus discovered the precession of the equinoxes and the eccentricity of the sun's path, determined the length of the solar year and the distances of the sun and moon respectively from the earth, invented the planisphere, drew up a catalogue of 1080 stars, and fixed the geographical position of places on the earth by giving their longitude and latitude. All that we have of his works is a commentary to the poetical description of the stars by Aratus, published in Patavius's *Uranologia* (1630). See Delambre's *Histoire de l'Astronomie Ancienne* (Paris, 1817).

Hipparion, a fossil genus of Equidæ. See HORSE.

Hippias and **Hipparchus.** See PISISTRATUS.

Hippocampus antiquorum.

Hippo. See BONA.

Hippocampus (Gr.; a sea-monster on which the gods rode), commonly called SEA-HORSE, a genus of curiously modified marine fishes, which, with the Pipe-fish (q.v.), compose the family Syngnathidæ, belonging to the order Lophobranchii, whose gills are disposed in tufts. They derive their generic name from the remarkable likeness which the head and neck bear to those of a horse, or perhaps even more strikingly to those of the knight in a set of chessmen. They are all characterised by the prehensile tail devoid of a fin, by which they cling to the stems of sea-weeds or corals, or even to each other; the body is compressed and more or less elevated; the shields have more or less prominent tubercles or spines; the hinder part of the head forms a flattened crest, terminating above in a prominent knob (coronet); pectoral fins and a dorsal fin are present. The males have a pouch beneath the tail, in which they carry the eggs until they are hatched. As in all other fishes of the order, there is a long snout, and at its extremity a small toothless mouth. The fins vibrate with great rapidity, and present the appearance of a rotating wheel or a delicate waving web, but the animals move only slowly and for a short distance at a time, usually in a half upright posture. There are about twenty species, mostly inhabiting tropical seas; some have a wide area of distribution, as they are not unfrequently carried to great distances by floating materials to which they have attached themselves. *H. antiquorum* of Australia, the Atlantic, and Mediterranean, is occasionally found

Phyllopteryx eques.

on British shores. The allied genus Phyllopteryx, of which three species are known from Australia, is remarkable for its long streaming filaments, which very closely mimic the fronds of the Fucus among which it lives.

Hippocampus. See BRAIN.

Hippocras (*vinum Hippocraticum*, 'wine of Hippocrates'), an aromatic medicated wine, formerly much used as a cordial. It was prepared from white wine, flavoured with cinnamon and other spices, lemon peel, almonds, &c., and sweetened with honey or sugar.

Hippocrates, the most celebrated physician of antiquity, was the son of Heracleides, who was also a physician, and belonged to the family of the Asclepiadæ, Hippocrates himself being either nineteenth or seventeenth in descent from Æsculapius. His mother, whose name was Phænarete, was said to be descended from Hercules. He was born in the island of Cos, probably about 460 B.C. He is said to have been instructed in medicine by his father and by Herodicus, and in philosophy by Gorgias of Leontini, the celebrated sophist, and Democritus of Abdera, whose cure, when he was mentally deranged, he afterwards effected. After visiting some parts of Greece, particularly Athens, then at its intellectual zenith, he settled in practice at Cos. He died at Larissa, in Thessaly, but at what age is uncertain, different ancient authors stating it to have been at 85, 90, 104, and 109 years. Clinton (*Fasti Hell.*) places his death 357 B.C., at the age of 104. We know little more of his personal history than that he was greatly esteemed as a physician and an author, and that he raised the medical school of Cos to a very high reputation.

His works were quoted by Plato, who compared him to Polycletus and Phidias, and by Aristotle, who called him 'the great.' Various stories are recorded of him by Greek writers, to which, being undoubtedly fabulous, it is unnecessary to advert; and we find legends regarding him in the works of Arabic writers, who term him 'Bokrat,' while the European story tellers of the middle ages celebrate him under the name of 'Ypocras,' and, in defiance of chronology, make him professor of medicine at Rome, with a nephew of wondrous medical skill, whom he despatched in his own stead to the king of Hungary.

The works bearing the name of Hippocrates, and termed the Hippocratic Collection, are more than sixty in number, and were divided by Dr Greenhill into eight classes. The first class comprises works *certainly* written by Hippocrates, including *Prognostica*; *Aphorismi*; *De Morbus Popularibus*; *De Ratione Victus in Morbis Acutis*; *De Aere, Aquis, et Locis*; and *De Capitis Vulneribus*. Some eminent critics doubt the genuineness of some portions of the *Aphorismi*, the work by which Hippocrates is most popularly known. The second class is composed of works *perhaps* written by Hippocrates. They are eleven in number, and one of them is the well-known *Jusjurandum*, or 'Hippocratic Oath.' The others consist of works written before Hippocrates, works whose author is conjectured, works by quite unknown authors, wilful forgeries, &c.

For anything like a full account of his views we must refer to the various writers who have treated of the history of medicine. We can here only mention that he divides the causes of disease into two principal classes: the first consisting of the influence of seasons, climates, water, situation, &c.; and the second of more personal causes, such as the food and exercise of the individual patient. To the influence which different climates exert on the human constitution he confidently ascribes both the conformation of the body and the disposition of the mind, and hence accounts for the differences between the Greek and the less hardy Asiatic. The four fluids or humours of the body (blood, phlegm, yellow bile, and black bile) were regarded by him as the primary seats of disease; health was the result of the due combination (or *crasis*) of these, the disturbance of which produced illness. When a disease was proceeding favourably these humours underwent a certain change (or *coction*), which was the sign of returning health, as preparing for the expulsion of morbid matter, or *crisis*, these crises having a tendency to occur at definite periods, which were thence called 'critical days.' His treatment of diseases was cautious, and what we now term expectant; it consisted chiefly and often solely in attention to diet and regimen; and he was sometimes reproached with letting his patients die by doing nothing to keep them alive.

The works of Hippocrates were translated at an early period into Arabic. They were first printed in a Latin translation in 1525 at Rome. The first Greek edition (the Aldine) appeared the following year at Venice; an edition by Mercuriali appeared in 1588, one by Foes in 1595, and one by Van der Linden in 1665. Others have appeared under the editorship of Chartier, Kühn, &c. The best edition, with an admirable French translation, is that of Littré (10 vols. 1839–61). A scholarly edition by Ermerius, with a Latin rendering, was published in 1859–65 at Utrecht, at the expense of the university of Amsterdam. An excellent English translation of the *Genuine Works of Hippocrates* was published in 1849, in 2 vols., by Dr Adams of Banchory, Aberdeenshire.

Hippocrene (derived from *hippos*, 'a horse,' and *krēnē*, 'a fountain'), a fountain on the northern slope of Mount Helicon, in Greece, sacred to the Muses and Apollo, which, according to the mythical account, was produced by a stroke from the hoof of the horse Pegasus (q.v.). It is identified with a spring at the modern Makariotissa.

Hippodamia, the beautiful daughter of Œnomaus, king of Pisa, in Elis. It had been predicted to her father that he should be slain by his future son-in-law; he therefore stipulated that every suitor of his daughter should run a chariot-race with him, and that death should be the consequence of defeat. At length Pelops bribed the king's charioteer, and thus succeeded in reaching the goal before Œnomaus, who, in despair, killed himself. Hippodamia became by Pelops the mother of Atreus and Thyestes.

Hippodrome (Gr. *hippos*, 'a horse,' and *dromos*, 'a racecourse'), the Greek name for the place set apart for horse and chariot races. Its dimensions were, according to the common opinion, half a mile in length, and one-eighth of a mile in breadth. In construction and all the most important points of arrangement it was the counterpart of the Roman Circus (q.v.). See also OLYMPIC GAMES, CONSTANTINOPLE.

Hippogriff, or HIPPOGRYPH (Gr. *hippos*, 'a horse,' and the word *gryph*, 'griffin'), a fabulous animal, unknown to the ancients, which is represented by modern writers as a winged horse with the head of a griffin. The hippogriff figures as the horse of the Muses, and plays a conspicuous rôle in the *Orlando Furioso* of Ariosto.

Hippolytus, a Christian writer who enjoyed great celebrity in the first half of the 3d century, but of whose personal history we know but little with certainty. He was born most likely about 155–160 A.D., and died about 235 or 236. The first to mention him is Eusebius, who says he was a bishop somewhere, and some writers have placed his diocese in Arabia, while almost all the eastern writers style him Bishop of Rome. He is usually described by modern writers as Bishop of Portus, near Rome, but for this title there is no evidence earlier than the middle of the 7th century. He may have been a native of the East, and he is said to have been a disciple of Irenæus; but this may have been either in Asia Minor, in Gaul, or in Rome itself, which Eusebius tells us that Irenæus visited about 178. An entry in the Liberian Catalogue of bishops of Rome tells that Pontianus the bishop and Hippolytus the presbyter were transported as exiles to the mines of Sardinia, where ere long they perished, their bodies being carried back to Rome. Prudentius (5th century) gives a different but much less credible account of the martyrdom of Hippolytus, according to which he was torn in pieces by wild horses like the Hippolytus of mythology. He tells us that he was infected with the Novatian heresy, but recanted on the way to martyrdom. Such was the unsatisfactory state of knowledge when the recovery at Mount Athos by Minoides Mynas in 1842 of the treatise against heresies cast fresh light upon Hippolytus as its presumptive author. It was contained in a 14th-century MS., and when published by Miller in 1851 was recognised as forming part of the fragment ascribed to Origen and entitled the *Philosophumena*. Its appearance opened up a grave discussion. The Origenistic authorship was soon abandoned, and attempts were made by Baur to ascribe it to Gaius, by De Rossi to Tertullian, by Armellini to Novatian. Jacobi advanced the claims of Hippolytus, and this theory was supported by Bunsen and Wordsworth, and so conclusively proved by Döllinger as to persuade almost every scholar save Lipsius, who still continued to describe the author as Pseudo Origenes.

From the treatise itself we learn that the autho

lived at Rome, and took an active part in church affairs under the bishops Zephyrinus and Callistus. Döllinger points out that throughout Hippolytus never recognises Callistus as bishop, and treats him only as the founder of a school. Besides he assails his moral character and his antecedents, charging him with dishonesty, with criminal laxity of discipline, and with the Patripassian heresy; while Callistus again retorted upon his opponent with a counter-charge of Ditheism. Döllinger held that Hippolytus claimed to be the real Bishop of Rome himself, and that he was thus the first antipope in the history of the Roman Church. This would explain the circumstance that a writer so learned and outstanding as Hippolytus could be taken by the Eastern Church for the actual Bishop of Rome, while to western writers who did not receive him as such he seemed guilty not only of schism but of heresy. But the grave difficulty remains of being obliged to believe that a schism so serious, headed by the most illustrious theologian of the time, and lasting at the very lowest five or six years, could have occurred without its being known outside of Rome, and still further could be utterly forgotten for fifteen centuries. Again, if Hippolytus had headed a party so inimical to the authority of the bishop, how comes it that his name has descended without a stain as that of a saint and a martyr? Dr Salmon suggests the explanation that Hippolytus may have been the head of the Greek Christians at Rome, and that as such he may have been specially entrusted with some episcopal functions—an anomalous state of matters which would come to an end with the necessity for it. His attacks on Callistus were written in Greek for Greek-speaking people, hence the faintness of the impression they made upon the Latin world; while at the same time most of the recollections of the earlier part of the century were lost in the severity of persecution under Decius and Valerian. At anyrate the state of the controversy shows that in the 3d century Christians elsewhere than at Rome itself were not much interested in the question who was Bishop of Rome at all. Hippolytus seems to have championed the severe and ultra-orthodox party in the Roman Church, and at the least to have been bitter and prejudiced as a controversialist. The ecclesiastical charges brought against Callistus in this famous treatise are his giving easy absolution to sinners excommunicated by Hippolytus and others, admitting digamists and trigamists to the ranks of the clergy, allowing the clergy to marry, and permitting Christian ladies to contract illegal marriages with men of inferior social rank.

The date of Hippolytus and his importance among his contemporaries are proved further by the statue of him discovered at Rome, on which is engraved the sixteen years' cycle which he invented to find the time of Easter. This cycle is an erroneous one, the error being of such a nature as could not fail to be discovered after a dozen years, hence it follows that the statue in his honour must have been inscribed before that discovery occurred, about 240 A.D.

The extant writings of Hippolytus were first collected by Fabricius (2 vols. Hamburg, 1716-18), and have since been printed in vol. II. of Galland, *Bibl. Vet. Pat.*, and vol. X. of Migne's *Patr. Gr.* The most accessible edition is that of Lagarde (1858). English translations of the *Refutation*, as well as the other extant works and fragments, may be found in Clark's 'Ante-Nicene Christian Library.' Bishop Lightfoot thought it more than probable Hippolytus was the author of the famous Muratorian Canon, as there was no other man at that time at Rome capable of writing it.

See Bunsen, *Hippolytus and his Age* (1852; 2d ed. 1854); Christopher Wordsworth, *St Hippolytus and the Church of Rome* (1853; 2d ed. 1880); Döllinger, *Hippolytus and Kallistus* (1853; Eng. trans. by Plummer, 1876); Volkmar, *Hippolytus u. die Römische Zeitgenossen* (1855); Lipsius, *Zur Quellen kritik des Epiphanios* (1865), also *Die Quellen der ältesten Ketzergeschichte* (1875); and Harnack, *Zur Quellen-kritik der Geschichte des Gnostizismus* (1873-74).

Hippophagy. Hippophagi (Gr., 'eaters of horse-flesh') was a name given by the Greeks to a Scythian people, living north-east of the Caspian Sea, and to a Sarmatian tribe north of the Euxine. In some parts of modern Europe horse-flesh is a regular and wholesome article of diet. In France a society of hippophagists was formed under the auspices of Geoffroy St Hilaire; in 1866 the sale of horse-flesh in the Paris markets as an article of food was officially recognised and regulated: and during the siege of Paris horse-flesh was gladly eaten by all who could get it. In 1872 about 5000, in 1895 over 30,000, horses were eaten in Paris alone. In Britain an act was passed in 1889 regulating the sale of horse-flesh, requiring that all horse-flesh (or flesh of asses and mules) exposed for sale shall be expressly so described in legible and conspicuous characters, and imposing a penalty of £20 on any one breaking this rule, or giving any one horse-flesh who has asked for meat other than horse-flesh.

Hippopotamus (Gr., 'river-horse'), a genus of artiodactyle ungulate mammals, constituting a family by itself. Till of late only one species was known as now existing, although the fossil remains of others indicate the greater abundance and wider distribution of the form in other periods of the earth's history. The largest and best-known species, *H. amphibius*, is—or, within historic periods, has been—found in almost all parts of Africa, to which

Hippopotamus amphibius.

quarter of the globe it is entirely confined. A smaller species, *H. liberiensis* (distinguished by some as a distinct genus, Cæropsis), was described in 1844 as an inhabitant of the rivers of western Africa within the tropics, and differs from the common species, and from all the fossil species, in having only two incisors, instead of four, in the lower jaw. But as the missing teeth occasionally exist there seems no valid reason for separating this form generically. The common hippopotamus is one of the largest of existing quadrupeds, the bulk of its body being little inferior to that of the elephant, although its legs are so short that its belly almost touches the ground, and its height is not much above five feet. It is extremely aquatic in its habits, living mostly in lakes or rivers, often in tidal estuaries (where the saltness of the water compels it to resort to springs for the purpose of drinking), and sometimes even in the sea, although it never proceeds to any considerable distance from the shore. Its skin is very thick—on the back and sides more than two inches; it is dark brown

(albino and piebald individuals have been seen), destitute of hair, and exudes a reddish fluid, which has been said to have given rise to the legends of sweating blood. The tail is short. The feet have each four toes, nearly equal in size, and hoofed. The neck is short and thick. The head is very large, with small ears, and small eyes placed high, so that they are easily raised above water, without much of the animal being exposed to view. The muzzle is very large, rounded, and tumid, with large nostrils and great lips concealing the large front teeth. The hippopotamus cuts grass or corn as if it were done with a scythe, or bites with its strong teeth a stem of considerable thickness neatly through. The skull, while it is distinguished by remarkable peculiarities, corresponds in the most important characters with that of the hog. The respiration of the hippopotamus is slow, and thus it is enabled to spend much of its time under water, only coming to the surface at intervals to breathe. It swims and dives with great ease, and often walks along the bottom, completely under water. Its food consists chiefly of the plants which grow in shallow waters and about the margins of lakes and rivers; and it probably renders no unimportant service in preventing slow streams from being choked up by the luxuriance of tropical vegetation, the effect of which would, of course, be an increase of the extent of swampy land. It often, however, leaves the water, chiefly by night, to feed on the banks, and makes inroads on cultivated fields, devouring and trampling the crops. It is a gregarious animal; and the havoc wrought by a herd of twenty or thirty is very great, so that wherever cultivation extends war is waged against the hippopotamus, and it disappears from regions where it formerly abounded. Thus it is no longer found in Lower Egypt, although still abundant farther up the Nile. It is taken in pits, which are digged in its usual tracks; it is killed by poisoned spears, is pursued by means of canoes, is harpooned, and is shot. The flesh is highly esteemed; the fat, of which there is a thick layer immediately under the skin, is a favourite African delicacy, and when salted is known at the Cape of Good Hope as *Zee-koe speck* ('Lake-cow bacon'). The tongue and the jelly made from the feet are also much prized. The hide is used for a variety of purposes; and the great canine teeth, which sometimes weigh 8 or even 12 lb., are particularly valuable as ivory, and are a very considerable article of African commerce.

The hippopotamus is lively and playful in its native waters; it soon learns to avoid man; and, when it cannot retire among reeds for concealment, it dives and remains long under water, raising only its nose to the surface when another breath becomes necessary. The female may sometimes be seen swimming with her young one on her back. The hippopotamus is generally inoffensive, but is occasionally roused to fits of rage, in which it becomes extremely dangerous, particularly to those who pursue it in boats. The voice is loud and harsh, and is likened by Burckhardt to the creaking and groaning of a large wooden door. That the animal is capable of being tamed, and of becoming much attached to man, has been sufficiently proved by the instances of living specimens in London and Paris. The first specimen brought to Europe in modern times, a young one from the Nile, arrived in London in 1850. The hippopotamus, however, sometimes appeared in the spectacles of the ancient Romans. It is very generally supposed to be the Behemoth of the book of Job.

Fossil Species.—A number of species of hippopotamus have been described from the later Tertiary strata; but in those times the distribution was not, as it is now, limited to the African continent. Their remains have been found in India and Madagascar as well as Europe. They occur in fresh-water marls, and in the bone-caves, into which they had been carried for food by the carnivorous animals that used the caves as dens. One species found in England and in considerable abundance in the southern countries of Europe was of a size as much greater than the living species as its companion, the mammoth, was greater than the living elephant.

Hippuric Acid, $C_9H_9NO_3$, is a compound of great interest both to the chemist and to the physiologist. It derives its name from its having been first discovered in the urine of the horse, and that fluid, or the renal secretion of the cow, affords us the best and readiest means of obtaining it. The crystals of hippuric acid are moderately large, colourless, but subsequently becoming milk-white, four-sided prisms, which are devoid of odour, but have a faintly bitter taste. They dissolve readily in boiling water and in spirit, but are only sparingly soluble in cold water and in ether. It is an abundant normal constituent of the urine of the horse, cow, sheep, goat, hare, elephant, &c., and most probably is to be found in the urine of all vegetable feeders. In the human urine of healthy persons living on an ordinary mixed diet it occurs in very small quantity, but it is increased by an exclusively vegetable diet, and in the well-known disease diabetes.

The hippuric acid occurring in the animal organism exists in combination with bases, and chiefly as hippurate of soda and hippurate of lime. The last-named salt can be obtained by the mere evaporation of the urine of the horse. The chief interest of the substance is that it was one of the first to be discovered of a long series of complex bodies, which we now know are formed synthetically in the animal body. Hippuric acid readily splits into benzoic acid and glycocoll. If benzoic acid is administered it is excreted as hippuric acid, combining with glycocoll in the body. In herbivorous animals the benzoic acid is largely derived from the food; in animal feeders even in starvation it occurs in small amount in the urine, and we must therefore conclude that its forerunners may be derived from the metabolism of the tissues. That certain bodies closely allied to benzoic acid may be so formed has now been experimentally demonstrated, while glycocoll can also be proved to be so produced. At one time the belief was entertained that these bodies were combined in the liver; but more recent research has shown that the synthesis chiefly takes place in the kidneys.

Hippurites, a very remarkable genus of fossil bivalves, peculiar to the Cretaceous strata, and so abundant in some of the Lower Chalk beds of the Pyrenees and other places that the series has received from some continental geologists the name of Hippurite Limestone. The external form of the shell is so anomalous that the genus has been tossed about by naturalists in an extraordinary manner; some having called it a coral, others an annelid, others a barnacle, and so on, though the majority held it to be at least a mollusc. The investigations of S. P. Woodward showed that the Hippurites were divergent bivalves. The right valve is very large, and elongated into a cone, while the left valve is inconspicuous, often like a lid, and perforated by radiating canals. Including allied genera or sub-genera —e.g. Radiolites and Caprinella—there are over a

A Hippurite.

hundred species, all restricted to the Chalk and Chalk-marl.

Hiring. The contract of hiring, called in the law of England bailment for hire, and in that of Scotland location, is of two kinds—the hiring of things, as where household furniture is let to be used in the ordinary way; and the hiring of work, as where a tailor's labour is hired to make a suit of clothes. In hiring of the first kind, hiring of things, it is the duty of the person letting out the thing to deliver it to the hirer, to refrain from interfering with the hirer's use of the thing during the subsistence of the contract, to do nothing to deprive the hirer of the use, to warrant that the thing hired is fit for the use for which it is let, and to keep the thing free from faults and defects inconsistent with the proper use of it, and in suitable order and repair. The hirer acquires no right of property in the thing hired, but acquires its possession and the exclusive right to its use for the period of the agreement. He has to use the thing well and with care, not to put it to any other use than that for which it is let, to restore it at the expiry of the time agreed on, and to pay the stipulated hire. The contract of hiring is a different agreement from those made under what is known to traders as the 'hire-purchase' system, as where a piano is handed over by its owners to a purchaser under the conditions that a certain sum shall be paid periodically as hire, and that after a certain number of such periodical payments have been made the piano shall become the property of the person making the payment. No such contract as one of 'hire-purchase' is recognised by law; and in the cases which have come before the courts under this system the question always is whether the contract, whatever it may be called by the parties, is legally a contract of hiring or a contract of sale. The answer will depend upon the particular terms of each agreement. These, however, are usually so framed as to make the contract, not one of hiring, but one of sale with a suspensive condition that the thing delivered shall not become the property of the person to whom it is sold until he has paid the full number of periodical payments bargained for. These payments, though they may be called hire by the parties to such an agreement, are legally only so many instalments of the price of a thing sold. A piano or other article delivered under such an agreement does not become the property of the holder until all these instalments are paid; and it cannot be attached by the creditors of the holder as an asset in his estate. Nor can it be lawfully sold by the holder. It remains the property of the person letting it out, and he can recover it even from one who has purchased it in good faith from the person by whom it was hired. Hiring of the second kind above mentioned, hiring of work, may be subdivided into (*a*) the hire of services, as where a shoemaker is employed to mend shoes; (*b*) the hiring of care in custody, as where warehousemen or wharfingers are employed to store things; and (*c*) the hiring of the carriage of goods. In cases of the first kind the workman is bound to do the work agreed on, to do it at the time agreed on, to do it well, and to use an appropriate degree of care in performing the particular task. Employees in the last two classes are bound to take ordinary care of the goods entrusted to them, and are responsible for damage done by their negligence. See also LANDLORD AND TENANT, INN, MASTER AND SERVANT, CARRIER, &c.

Hirschberg, a manufacturing town of Prussian Silesia, is romantically situated at the influx of the Zacken to the Bober, 1116 feet above sea-level, and 78 miles WSW. of Breslau by rail. It is the centre of the extensive textile, lace, paper, and other manufactures of the district. Pop. (1875) 12,970; (1885) 15,622; (1890) 16,124.

Hispania. See SPAIN.

Hispaniola ('Little Spain'). See DOMINICAN REPUBLIC and HAYTI.

Hissar, a province of Bokhara, from which it is separated by a southern offset of the western prolongation of the Thian-Shan Mountains. This range forms its northern boundary. The country consists of a series of valleys, radiating from this mountainous background, and lying open on the south, traversed by streams which flow in general south or south-west to join the Oxus or Amu-Daria. The soil is fertile, and yields wheat, flax, cotton, rice, and garden fruits. Copper and rock-salt abound. The inhabitants (number not exactly known) are chiefly Usbegs and Tajiks. They export corn, salt, flax, and sheep to Bokhara. The main route from India to Bokhara passes through the province; and Hissar has its chief access with Bokhara, 230 miles to the north-west, through a celebrated pass called Kohluga or the Iron Gate. The province was annexed by the emir of Bokhara in 1869. The capital is the town of Hissar, with 15,000 inhabitants, on the Kafirnihan River. Its people are noted sword-makers.

Hissar, the capital of a district of that name in the Punjab, on the Western Jumna Canal, 102 miles W. of Delhi. Pop. 14,167. The district of Hissar, lying on the western verge of the Bikanir desert, has an area of 5163 sq. m., and its soil, when watered, is fertile and produces rice, millet, barley, grain, wheat, &c.; but it is mainly a sandy plain, very liable to suffer from drought in dry years. Pop. (1891) 776,006.

Hissarlik. See TROY.

Histology (derived from the Greek words *histos*, 'a web or texture,' and *logos*, 'a discourse') is the science which classifies and describes the structural or morphological elements which exist in the solids and fluids of organised bodies. It is identical or nearly so with general minute anatomy and with microscopic anatomy. Although its origin may be traced to the times of Malpighi (1628–94), who discovered the blood-corpuscles, and of Leeuwenhoek (1632–1723), who, with comparatively imperfect optical means, added much to our knowledge of the minute structure of the tissues, it never made any definite progress till the second decennium of the 19th century, when the compound microscope began to assume its present improved form. It was by means of this microscopico-chemical examination that the structure of the different horny tissues was first clearly exhibited, and it was thus proved that nails, cow's horn, and whalebone are aggregations of individual cells. Portions of the subject are dealt with in our articles on BONE, BRAIN, CIRCULATION, DIGESTION, GLAND, MUSCLE, NERVOUS SYSTEM, &c.; and see ANATOMY. For Vegetable Histology, see VEGETABLE PHYSIOLOGY, BAST, LEAF, TISSUES, WOOD, &c.

In Germany animal histology has been cultivated by Schwann, Henle, Valentin, Remak, Kölliker, Virchow, Leydig, Frey, and a host of others scarcely less distinguished; in Holland it has been actively prosecuted by Donders, Harting, and others; Lebert, Mandl, Robin, and others have contributed to the French literature of the subject; while in Britain the names of Todd and Bowman, of Goodsir, Quekett, Bennett, Sharpey, Clarke, Wharton Jones, Beale, and Huxley deserve honourable notice.

Hit (anc. *Is*), a town of Turkey in Asia, on the Euphrates, 85 miles WNW. of Bagdad, has pits of bitumen, which have been worked from time immemorial, and naphtha-springs. Pop. about 2500.

Hitchcock, Edward, geologist, born at Deerfield, Massachusetts, May 24, 1793, was successively Congregational pastor in Conway, Massachusetts (1821–25), professor of Chemistry and Natural History (1825–45) and of Natural Theology and Geology (1845–64) in Amherst College, of which he was also president from 1845 to 1854. He died on 27th February 1864. He was state geologist of Massachusetts in 1830–44, and of Vermont in 1857–61, and published very full reports, as well as a volume (and supplement) on the *Ichnology of New England* (1858–65). In 1850 he was commissioned by the state to visit and examine the chief agricultural schools of Europe (*Report*, 1851). But he chiefly distinguished himself in the geological department of natural theology, writing *The Religion of Geology and its connected Sciences* (1851), which had a very wide circulation on both sides of the Atlantic. His *Elementary Geology* (1840) was also popular both in America and in England. Hitchcock took an active part in founding the American Association of Geologists and Naturalists, and was its first president in 1840. He was also one of the foundation members of the National Academy of Sciences (1863).

Hitchin, a thriving market-town of Hertfordshire, on the Hiz, through the Ivel a feeder of the Ouse, 32 miles NNW. of London. An important railway junction, it has a fine old parish church, a modern town-hall, a free school (1622), a Friends' school, &c. The principal trade is in corn, malt, and flour; there are several large breweries; and many females are employed in straw plaiting. Lavender has been grown here since 1568, and commercially, for lavender-water, since 1823. Hitchin was a place of some consequence in the days of King Alfred. It was the original seat of Girton College (q.v.). Pop. (1851) 5258; (1891) 8860.

Hitopade'sa (lit. 'salutary counsel'), a famous collection of fables and stories in Sanskrit literature, usually ascribed to the compilation of the Brahman Vishnusarman. It is a popular summary in four books of the larger work, the famous *Panchatantra*, which directly and indirectly has been the source whence a rich stream of folk-tales has flowed westwards over Europe. An edition of the text, with an English translation, was published by F. Johnson in 1864; a French translation by E. Lancereau in 1882.

Hitteren, an island off the west coast of Norway; area, 203 sq. m. Pop. 2700.

Hittites, the English name of a people who waged war with Egypt and Assyria for a thousand years, and who moved on parallel lines with the people of Israel from the call of Abraham to the Captivity. The Hittites have scarcely any record in classical history, but in late years we have much information respecting them from various sources.

First in order and importance are the narratives of the Old Testament. When the Semitic tribe with Abraham at their head moved from Haran to Canaan the Hittites inhabited the land (Gen. xv. 20), and fifty years later Abraham, a wandering sheikh, purchased a grave for his wife from the Hittites, who were then in possession and power at Hebron (Gen. xxiii. 4). The patriarch's family continued to live side by side with the Hittites; and Esau, the *bedawi*, the grandson of Abraham, married two Hittite wives, who 'were a grief of mind unto Isaac and to Rebekah' (Gen. xxvi. 35). During the sojourn in Egypt the Israelites had the promise of occupying the land of the Hittites oft repeated, and from the bush on Horeb the promise was again renewed to bring them 'into the place of the Canaanites, and the Hittites, and the Amorites, and the Perizzites, and the Hivites, and the Jebusites' (Exod. iii. 8). We now see that these peoples are mentioned in their topographical order as viewed from the Egyptian standpoint. The traveller northward from Egypt first came to Canaan, then he reached the Hittite colony in the neighbourhood of Hebron, and finally arrived at the Jebusites, who then inhabited Jebus, afterwards known as Jerusalem. After the exodus the spies found 'the Hittites, and the Jebusites, and the Amorites' dwelling in the mountains whither they had been driven by successive Egyptian invasions. The Hittites were conspicuous among those who opposed Joshua's entrance into the promised land, and the serried lines of Hittite chariots were scattered in confusion by Joshua's army in the decisive battle by Lake Merom. Hittite captains marshalled and led the hosts of David and Solomon, and Hittite ladies were conspicuous in the harems of the same renowned monarchs (1 Kings, xi. 1). King David pushed his conquests and extended his border in 'the land of the Hittites' (the correct reading in 2 Sam. xxiv. 6 being not *Tahtim-hodshi* but '*Kedesh of the Hittites*'); and, in the time of Jehoram, Benhadad of Damascus fled headlong from Samaria with his Syrian horde when an alarm was raised that the Hittites were coming (2 Kings, vii.). The geographical position generally of the Hittites in the time of Joshua was 'from the wilderness and this Lebanon, even unto the great river, the river Euphrates . . . and unto the going down of the sun' (Josh. i. 1–4). This summary of the most important references to the Hittites in the Old Testament covers a period of a thousand years.

Next in importance is the testimony of the Egyptian and Assyrian inscriptions. In the Egyptian inscriptions the Hittites stand out as rivals of the Pharaohs in peace and war from the 12th to the 20th dynasty. As soon as the key was found to the long silent records of Egypt and Assyria the veil began to lift off dark continents of history, and the forgotten but mighty Hittite people began to emerge; and now in the increasing light from Egypt and Assyria they stand before us in broad outline and in incidental detail. The two capitals of the Hittites were Kadesh on the Orontes and Carchemish on the Euphrates. The centre of their empire was in the north, but as an enterprising people they pushed a wedge-like colony down through Syria as far as Hebron and Egypt. According to Brugsch, the Hittites appeared on the Egyptian border as early as the 12th dynasty. The capital of the Hyksos dynasty was Zoan or Tanais, and Mariette declares that one of the Hyksos dynasties was Hittite. In the Old Testament there is a curious statement that 'Hebron was built seven years before Zoan.' This casual statement now seems to indicate the order in which the Hittites consolidated their advance southward. The wave of invasion reached Hebron and made a lodgment there nine years before it swept over the border and made a lodgment in the land of Goshen. The discoveries at Tel-el-Amarna in 1887 throw additional light on the Hittites in Syria and Palestine, and a despatch written on a clay tablet, now at Berlin, contains an urgent request from Egyptian officers in Palestine for Egyptian assistance against the Hittites, then marching southwards.

Thothmes III. came to the throne about 1600 B.C. The monuments of his reign, one of which stands on the banks of the Thames, are very numerous. In the hieroglyphics of Karnak there is a detailed account of thirteen campaigns waged by this Pharaoh against the Hittites. Great battles were fought at Megiddo, at Carchemish, at Kadesh, and elsewhere, and the Egyptian records boast of victories over the Hittites; but the Hittite resistance was not broken, and succeeding years saw

new Egyptian armies marching through the length of Syria against the hereditary foe. On the death of the great Thothmes the Hittites became more formidable, and after about fifty years of constant wars a treaty of peace was concluded between Rameses I. and Saplel the Hittite king.

Seti I. came to the throne two hundred years after the death of Thothmes III., and he at once marched against the Hittites as the 'avenger of broken treaties.' The details of this sanguinary campaign are depicted in the battle scene on the north side of the great temple of Karnak. At this period the Hittites were dominant in Syria, for one of the inscriptions declares that Syria was brought into subjection through Pharaoh's victory over the Hittites.

Rameses II., the Pharaoh of the oppression, succeeded his father, Seti I., and carried on the war in many campaigns. Many temples are adorned with the records of his achievements, the chief of which was his famous battle with the Hittites at Kadesh. Pentaur was present with the Pharaoh as war-correspondent, and he has recorded the events of the day in the world's most ancient epic. A copy of the epic adorns many temples in Egypt, and is written on a papyrus roll now in the British Museum. Kheta-sira had assembled his confederates and allies from many lands, even from Troy, and the battle ended in a draw, followed by an offensive and defensive treaty, and a dynastic alliance. Kheta-sira treats with the Pharaoh on equal terms, and his name stands first in the world's oldest treaty, which was written in Hittite on a silver plate, Egyptian translations of which have come down to us. Kheta-sira went down into Egypt with his eldest daughter, who became Pharaoh's queen, and thus inaugurated an era of peace.

Mineptah, the Pharaoh of the Exodus, loyally maintained the treaty, and 'sent wheat in ships to preserve the lives of the Hittites.' More than a hundred years later Rameses III. waged a cruel war in the land of the Hittites, and it is recorded on the temple of Medinet Abou that he brought back into captivity the king of the Hittites. We thus learn from the Egyptian inscriptions that the Hittites were rivals of the Egyptians from the 12th to the 20th dynasty. The shock of Egyptian invasion exhausted itself at Kadesh and Carchemish, but the centre of Hittite power lay beyond in the broad plains and highlands of Asia Minor, and so they had fresh armies and abundant wealth to enable them to withstand the might of Egypt for a thousand years.

The Hittites occupy an important place in the Assyrian inscriptions. The reign of Sargon of Agade has been placed about the 19th century B.C.; and one date has been deciphered, which if correct would fix that reign about 3800 B.C. Even as early as the reign of Sargon I. the Hittites were a formidable power, and it has been supposed that in the time of the 19th dynasty in Egypt the Hittites occupied Mesopotamia. When we come to the era of Tiglath-pileser I., about 1130 B.C., the Hittites were paramount from the Euphrates to the Lebanon. Tiglath-pileser I. drove back the Hittites from his borders, and for a time made them tributaries, but they soon threw off the Assyrian yoke, and a desperate struggle for supremacy was waged for four hundred years between the empire of Assyria and that of the Hittites. The reign of Assur-nasir-pal (883–858 B.C.) is largely a record of wars with the Hittites. His son, Shalmaneser, undertook thirty campaigns chiefly 'in the land of the Hittites.' The war continued to the close of the king's reign, and was carried on by the kings who succeeded him; and one hundred years later the Assyrians were still in deadly conflict with the Hittites. The Hittites, who first appear in the Assyrian inscriptions in the reign of Sargon I., were destined to disappear from history in the reign of his namesake. Sargon II. came to the throne in 721 B.C., and his first year was distinguished by the capture of Samaria and the captivity of the Israelites, and four years later (717 B.C.) he brought the empire of the Hittites to a close by the defeat of Pisiri and the capture of Carchemish.

Thus ended the mighty empire of the Hittites, having maintained its existence, defying all enemies, longer than the empires of Babylon, or Assyria, or Greece, or Rome. The fact that the frontier towns of the Hittites had continued their resistance to the Assyrian arms, in almost yearly campaigns, throughout successive centuries, suggests that the Hittite empire must have been strong in resources beyond the frontier; and the mention of over 300 geographical Hittite names, in the inscriptions, shows how extended that dominion must have been.

In November 1872 the writer of this article succeeded in making casts of the famous Hamah (q.v.) inscriptions, which he declared to be Hittite remains. The theory, at first received with incredulity, is now admitted, and sculptures of the same character are now found to exist throughout the length and breadth of Asia Minor and northern Syria, from Hamah on the Orontes to Eyuk by the Halys, and from Carchemish on the Euphrates to the Euxine and the Ægean. A beginning has been made in decipherment, but the first steps, though sure, are slow. There is no room for doubt as to their Hittite origin. The cuneiform inscriptions were called Assyrian before Grotefend made the happy guess that led to their decipherment. The hieroglyphics were called Egyptian before Champollion and Birch began to unravel the mysteries of the Rosetta Stone; and it does not seem a violent supposition that the remarkable inscriptions 'in the land of the Hittites' may have been produced by the warlike but cultured people who once inhabited the land.

A set of Hittite inscriptions and sculptures may be seen in *The Empire of the Hittites*, by the present writer (1884; 2d ed. 1886), as well as chapters on Hittite geography, art, and learning, religion and nationality. See also Sayce, *The Hittites: or, the Story of a Forgotten People* (R. T. S., 1888); Léon de Lantsheere, *Les Hittites* (Brussels, 1892); Conder, *The Hittites and their Language* (1898).

Hitzig, Ferdinand, a German biblical scholar, was born 23d June 1807, at Hauingen, in Baden, and educated at Heidelberg, Halle (where the influence of Gesenius determined him in favour of Old Testament studies), and Göttingen. In 1833 he was called to Zurich as professor of Theology, and in 1861 returned to fill the similar chair at Heidelberg. The first work which established his fame was his commentary on Isaiah (1833). Besides a translation of the Psalms, with a commentary (1835–36), he furnished for the *Exegetisches Handbuch zum A. T.* the commentaries on the twelve minor prophets (1838; 4th ed. 1881), on Jeremiah (1841), Ezekiel (1847), Ecclesiastes (1847), Daniel (1850), the Song of Solomon (1855), Proverbs (1858), and Job (1875). This able and combative rationalistic critic is also known by *Die Erfindung des Alphabets* (1840), *Urgeschichte und Mythologie der Philistaer* (1845), *Geschichte des Volkes Israel* (1869–70), &c., and by numerous contributions to the learned journals. He died at Heidelberg, 22d January 1875.

Hivites ('villagers' or 'midlanders'), a Canaanitish people, the main body of which lived in the region from Lebanon and Hermon to Hamath, but who had colonies, apparently isolated, in southern Palestine, as at Gibeon.

H'Lassa. See Lhassa.

Ho. See Hoang-ho.

Hoadly, BENJAMIN, English prelate, was born at Westerham, in Kent, November 14, 1676, and educated at Catherine Hall, Cambridge, of which he became tutor after taking his degree of M.A. Two years after that event he was chosen lecturer of St Mildred in the Poultry, London, and with this office two years later still combined that of rector of St Peter-le-Poer. Hoadly figures amongst the principal controversial writers of the 18th century, ranking amongst the 'rationalists,' and defending the cause of civil and religious liberty against both the crown and the clergy. He carried on a controversy with Dr Atterbury on the extent of the obedience due to the civil power by ecclesiastics in such a way as to secure the applause of the House of Commons. His Low Church principles made him an opponent of Sacheverell, whom he contended against in the pulpit. As a reward for his attitude in this matter, and for his zeal against the doctrine of non-resistance, he was made a hero of by the Whigs. Through their instrumentality he was in 1710 presented to the rectory of Streatham in Surrey; and in 1715, when the accession of George I. had secured the triumph of Whig principles, Hoadly was made Bishop of Bangor. In 1717 he preached before the king a sermon on the text 'My kingdom is not of this world,' in which he endeavoured to show that Christ had not delegated his powers to any ecclesiastical authorities. Out of this originated the famous Bangorian Controversy, regarding which Hallam says that it was 'managed, perhaps on both sides, with all the chicanery of polemical writers, and is disgusting both from its tediousness and from the manifest unwillingness of the disputants to speak ingenuously what they meant.' The controversy branched off into such a multiplicity of side-issues, and produced such an extraordinary number of pamphlets (in July 1717 alone no less than seventy-four appeared), that the main question became almost irrecoverably lost in a tangle of extraneous matter. The public excitement it created is said to have been so great that business in London was virtually at a standstill for some days. The dispute had, however, one important consequence—the indefinite prorogation of Convocation (q.v.). In 1721 Hoadly was transferred to the see of Hereford, in 1723 to that of Salisbury, and in 1734 to that of Winchester. He died at Chelsea, April 17, 1761. His *Collected Works* were published by his son in 1773, with Life prefixed.

Hoang-ho ('Yellow River'), or simply Ho, one of the principal rivers of China, more than 3000 miles in length, rises in the plain of Odontala, south of the Kuen-Lun Mountains, and has a tortuous course, described in the article CHINA, Vol. III. pp. 184, 185. From the southernmost corner of the province of Chih-li, which it crosses, the Yellow River flowed until recently eastward to the ocean, 650 miles distant, in 34° lat.; but in 1851–53 this wayward and turbulent stream, which is said to have shifted its course nine times in 2500 years, turned off near Kaifung-foo in a north-easterly direction. Since then it discharges its waters into the Gulf of Pechili, some 500 miles north of its former mouth, the mountainous province of Shan-tung lying between the two. The river is little used for navigation, Chinese vessels being unable to stem its impetuous current. In some parts of its eastern course, as in the case of the Po, the river-bed is above the great plain through which it passes. The embankments requisite for averting inundations are a source of never-ending expense to the government, and their yielding to floods a frequent cause of desolation to extensive districts of country. In 1887, by a dreadful inundation in Ho-nan, 'China's sorrow' destroyed millions of lives. The measures subsequently taken by the Chinese government to regulate the course of the river proved futile. About 170 miles of the upper course of the Hoang-ho were explored for the first time by Prejevalsky in 1880. The vast quantity of sediment conveyed to the sea by this river, giving it its colour and name, is taken up in that part of its course which lies between the provinces of Shan-hsi and Shen-hsi; beyond which its waters are remarkably clear.

Hoare, SIR RICHARD COLT, antiquary, was born at Stourhead, in Wiltshire, on 9th December 1758. The son of a banker, and after his accession to the baronetcy in 1787 a gentleman of wealth, he devoted his leisure time to travel and antiquarian pursuits. The results of his labours in these departments appeared in a translation of Giraldus Cambrensis (1806), *A Classical Tour through Italy and Sicily* (1819), *Ancient History of Wiltshire* (1812–19), and *Modern History of South Wiltshire* (1822–44). He died at Stourhead, 19th May 1838. See *Gentleman's Magazine*, July 1838.

Hoar-frost. See DEW.

Hoarseness. See THROAT.

Hoatzin. See TOUACO.

Hobart (till 1881 known as Hobart Town), the capital of Tasmania, stands on the estuary of the Derwent, about 12 miles from its mouth, in the south of the island. The city forms nearly a square, built on several hills, covering an area of about 1300 acres. A fine marine view may be obtained from Mount Pleasant. Besides Government House, the houses of parliament, and the government official buildings, Hobart has a museum, library, two cathedrals, thirty-five churches, and is well supplied with schools, hospitals, and hotels. The hospital for the insane is at Cascade, 2 miles distant. The water-supply is derived from springs on Mount Wellington. The town is lighted with gas, and tramways have been laid. The park known as the Queen's Domain has fine drives, and covers 1000 acres. In Franklin Gardens, in the centre of the town, are statues to Sir J. Franklin, a former governor of Tasmania, and Dr Crowther. The fine natural harbour and quay accommodate ships of the largest size; and there are three first-class patent slips. The cooler and more invigorating air of Hobart attracts large numbers of summer visitors from Australia. The chief industries are the manufacture of flour and jam, tanning, and iron-founding. Hobart has railway communication with Launceston, 133 miles distant, and frequent steam communication with Melbourne (443 miles NW.) and Sydney, and ports in New Zealand. Founded in 1804, the town was incorporated in 1857. The suburbs include New Town, Queenborough, Wellington, Glenorchy, Risdon, and Bellerive. About half-a-dozen daily and weekly newspapers are published. Pop. (1871) 19,092; (1891) 24,905.

Hobart Pasha, the HON. AUGUSTUS CHARLES HOBART-HAMPDEN, third son of the Earl of Buckinghamshire, was born at Waltham-on-the-Wolds, in Leicestershire, on 1st April 1822, and in 1836 entered the British navy. He first served against the slavers in Brazilian waters, then in the Baltic during the Crimean war, and there materially assisted in the capture of Bomarsund, in the attack on Åbo, and in the bombardment of Sveåborg. Shortly after the conclusion of the war he retired on half-pay. On the outbreak of the civil war in America he, as 'Captain Roberts,' took command of a blockade-runner, and several times got through the naval cordon that the North had established along the coasts of the Southern States, his adventures being most exciting and his escapes marvellous.

Lastly, he entered the service of Turkey (1867), and for his great services in checking the Greek blockade-runners to Crete in that year was raised to the rank of pasha and made admiral of the Ottoman fleet. On the outbreak of the Russo-Turkish war (1878) he took command of the Turkish Black Sea fleet. After each of these last pieces of active service his name was struck off the British Admiralty list, but on each occasion subsequently restored. He died on 19th June 1886 at Milan. He wrote *Sketches from My Life* (edited by his widow, 1887), and a book entitled *Never Caught* (1867), giving an account of his exploits during the civil war in America.

Hobbema, MEINDERT, landscape-painter, born in 1638, probably at Amsterdam. Few particulars of his life are known. He is believed to have studied art under Jacob Ruysdael, whose name appears as a witness to his marriage at Amsterdam, 2d October 1668, to Eeltije Vinck, who predeceased him in 1704. He died in poverty, and was buried in the Westerkerkhof, Amsterdam, 14th December 1709. His art usually deals with quiet subjects of Dutch cottage and woodland scenery, and these are treated with a skill which entitles the artist to rank along with Ruysdael at the very head of the landscape-painters of Holland. His works are subdued in tone, and finished with extreme care, yet with a singularly free and spirited touch, and are excellent in composition and lighting. Their figures were executed by Berchem, Adrian Vandevelde, and Lingelbach. Smith has catalogued 142 of his works, which now command very large prices, small landscapes from his hand having fetched from £5000 to £10,000. Seven of his works are in the National Gallery, London, and of these 'The Avenue, Middelharnis, Holland,' formerly in the Peel and Vander Pot collections, is an exquisite example. See E. Michel, *Hobbema et les Paysagistes de son Temps* (1890).

Hobbes, THOMAS, was born at Malmesbury on the 5th April 1588, and was the son of the vicar of Charlton and Westport adjoining that town. About the age of fifteen he was entered at Magdalen Hall, Oxford, where he was put through the usual course of Aristotelian logic and physics. His intellectual interests remained entirely unawakened, and long afterwards he attacked the universities in no measured terms for their failure to keep pace with the time. At the age of twenty, having taken his degree and quitted Oxford, he was recommended to Lord Hardwick, afterwards Earl of Devonshire, as tutor to his eldest son. This was the beginning of an intimate connection with that great family, which lasted through his long life. In 1610 he went abroad with his pupil, and made the tour of France and Italy. After his return he still continued to live with the Cavendish family, and his residence in London afforded him opportunities of becoming acquainted with Bacon, Herbert of Cherbury, Ben Jonson, and other distinguished men of the time. The first ambition to awake in him was that of the scholar, and he devoted his abundant leisure to a critical reading of the classical poets and historians. The outcome of these studies was his translation of Thucydides, which appeared in 1628, when he had already reached the mature age of forty. The Civil War was already looming in the distance, and in the choice of subject we may discern Hobbes's strong interest in politics—an interest which ultimately dominated his whole philosophy. The Earl of Devonshire died in 1626, and to Hobbes's great grief the second earl, his pupil, followed his father to the grave in 1628. Next year Hobbes accepted an engagement as travelling tutor to the son of Sir Gervase Clifton, and in this capacity paid a second visit to the Continent; but in 1631 his connection with the Devonshire family was resumed. By the desire of the dowager-countess he undertook the education of the young earl, the son of his former pupil, then only thirteen. From 1634 to 1637 they travelled abroad, and on this occasion Hobbes came into contact with Galileo in Italy, while in Paris he was admitted to the scientific and philosophical circle of which Père Mersenne was the centre.

Since 1629, when chance introduced him to a copy of *Euclid's Elements*, he had been an ardent student of geometry, and about the same time or a little later he began to be powerfully drawn to the new 'mechanical philosophy' of Galileo. In motion and the laws of motion he seemed to see a universal principle of explanation, and when he returned to England in 1637 it was with the outline of a comprehensive philosophical system already before his mind. Descartes, whose *Discourse on Method* appeared in that year, was also an adherent of the new physics, but limited and supplemented its explanations by the subjective principle of self-consciousness. Hobbes did not occupy himself (except incidentally) with the philosophical question of knowledge, but contented himself with giving an objective explanation of sensation and all mental facts in terms of motion. Regarded as the object of science, the world consisted, in Hobbes's view, of natural bodies (inanimate and animate) and political bodies, or organised aggregates of living men. Natural philosophy and civil philosophy therefore cover the whole ground; but, as the explanation of civil institutions is to be found in the nature of man, man stands out from among all other natural bodies, and forms, as it were, a bridge between nature and society. Accordingly Hobbes planned three systematic treatises, *De Corpore*, *De Homine*, *De Cive;* but the pressure of political events prevented him from publishing his ideas in their natural sequence, and some parts of the scheme are much less fully worked out than others. On his return to England he continued to live with the young Earl of Devonshire, and was on intimate terms with Lord Falkland, Hyde, and others engaged in the political struggles of the time. The need of a political philosophy which would put an end to anarchy by a true theory of the governing power became every day clearer to him, and in 1640 he wrote 'a little treatise in English' in defence of the royal prerogative. This is preserved in MS. under the title of *The Elements of Law, Natural and Politique*, and is identical with the two treatises, *Human Nature* and *De Corpore Politico*, published separately ten years later. Fearful lest the Parliament should take notice of his treatise, Hobbes fled in the same year to Paris, which continued to be his home till 1651.

He was welcomed by his scientific friends, and Mersenne induced him to contribute to Descartes' *Meditations* a series of criticisms thereon. But the political needs of the time still lay nearest his heart, and in 1642 appeared the *De Cive*, a fuller statement of his theory of government. Very few copies of this edition were struck off, and the book appeared with a new title in 1647 as *Elementa Philosophica de Cive*. In 1650 appeared the two treatises already mentioned, and in 1651 he issued a vigorous English translation of the *De Cive* (*Philosophical Rudiments concerning Government and Society*) by way of introduction to the comprehensive English work on which he had been engaged for several years. *Leviathan* was printed in England, and appeared in the summer of 1651. Its rationalistic criticism and its uncompromising reduction of religion to a department of state mortally offended the royalist clergy of the exiled court. Hobbes had been mathematical tutor to

Prince Charles in 1647, and the latter always continued to take a friendly interest in his old preceptor; but on the publication of *Leviathan* the author was informed that the young king refused to see him. With constitutional timidity he once more took refuge in flight. He returned to England in the end of 1651, and sent in his submission to the government of the Commonwealth, it being one of the principles with which *Leviathan* concludes that an ordinary citizen has a right to turn to a new power that can give protection, however little he may approve of the circumstances of its origin. Hobbes settled in London to work out the remaining parts of his scheme. The *De Corpore* appeared in 1655, and the *De Homine*, a rather perfunctory revision of the old *Human Nature* (with expansion on the side of optical theory), in 1658. From 1654 onwards Hobbes was engaged in almost perpetual controversy, first with Bramhall on liberty and necessity, and then with Ward, Wallis, and Boyle in defence of his own hopelessly indefensible mathematical ideas, which involved the quadrature of the circle and similar absurdities. The second controversy dragged over a quarter of a century, Hobbes's last blow being delivered after he had completed his ninetieth year. After the Restoration Charles granted him a pension of £100, and is said to have been always delighted with the old man's wit and repartees, but the bishops and the church party looked with no favour upon the author of *Leviathan*. A series of attacks upon the book began to appear, and it was condemned by the House of Commons in 1666. Three of his later works—*Behemoth*, *The Common Laws*, and a metrical *Historia Ecclesiastica*, all written about 1670—he was obliged to leave unpublished (though *Behemoth* issued surreptitiously from the press just before his death). A collected edition of his Latin works in 1668 had to appear at Amsterdam. At the age of eighty-four Hobbes amused himself by writing an autobiography in Latin verse, and within the next three years he completed a verse translation of the *Iliad* and the *Odyssey*. In 1675 he left London, and the rest of his days were spent at Hardwick and Chatsworth, the two Derbyshire seats of the Devonshire family. He died at Hardwick on the 4th December 1679, in his ninety-second year.

Hobbes stands between Bacon and Locke as the second in order of time of the great English philosophers, but he stands apart from both. It is by his contributions to scientific psychology, to ethics, and to political theory that he takes rank as an original thinker. In the present century attention has been drawn afresh to his acute psychological analyses by James Mill and the English associationists. His ethical theory, based on pure selfishness on the one hand and the arbitrary prescription of a sovereign power on the other, determined negatively the whole course of ethical speculation in England for a hundred years. Cumberland, Cudworth, and Clarke, and in a somewhat less degree Shaftesbury and Butler, are in the first instance critics and opponents of Hobbes. His political absolutism, however, is the most famous part of his speculations. The state of nature, he argues, is a state of war and insecurity (*homo homini lupus*). Moved by a desire to escape from the intolerable evils of such a condition, human beings enter into a species of contract by which they surrender their individual rights, and constitute a state under an absolute sovereignty. The sovereign power need not be monarchical (though Hobbes's individual preference is for that form of government), but, whatever form it assume, it is absolute and irresponsible. It was far from the intention of Hobbes to justify tyranny, but *Leviathan* was to him like 'a mortal god,' the only guarantee for security and settled government. The theory was substantially adopted by Spinoza; and, stripped of their accidental features, Hobbes's ethico-political ideas had great influence upon the philosophical Radicals of the 19th century. No account of Hobbes would be complete which omitted to mention his admirably clear and trenchant style. A collected edition of his works was published by Sir W. Molesworth in 16 vols. (1839–45). The best account of his life and his place in the history of thought is to be found in Professor Croom Robertson's *Hobbes* (Blackwood's 'Philosophical Classics,' 1886).

Hobby. See FALCON.

Hobhouse, JOHN CAM, the friend of Byron, was born in 1786, and was educated at Westminster and Trinity College, Cambridge. His *Journey through Albania with Lord Byron* he published in 1813. An advanced Liberal in politics, he stood for Westminster in 1818 without success, but was returned by a large majority in 1820, and sat later for both Nottingham and Harwich. Successively Irish Secretary, First Commissioner of Woods and Forests, and President of the Board of Control, he succeeded to his father's baronetcy in 1831, was created Baron Broughton in 1851, and died without male heirs, 3d June 1869, when the peerage became extinct, while the baronetcy passed to his nephew.

Hoboken, a city in New Jersey, on the west bank of the Hudson River, adjacent to Jersey city, and opposite New York, with which it is connected by several steam-ferries. It is the terminus of the Delaware, Lackawanna, and Western Railroad, and has a large shipping trade, especially in coal; iron-castings and lead-pencils are among the principal manufactures; and three lines of European steamships start from the port. The Stevens Institute of Technology here is one of the chief schools of its kind in the United States. Pop. (1880) 30,999; (1890) 43,648. The name of this city commemorates in the New World a village to the south-west of Antwerp, with a new fort and new docks.

Hobson-Jobson, a term given by English soldiers in India to the Moharram festival; being a corruption of the Shiite cry (see SHIITES), *Ya Hasan! Ya Hosain*. The name was adopted for the Anglo-Indian glossary by Colonel Yule and Mr Burnell (1886).

Hoccleve, or OCCLEVE, THOMAS (probably so named from the village of Hoccleugh in Northumberland), an English poet of whom but little is known save that he was born about 1368, was a clerk in the Exchequer, and was writing verse so late as 1448. His chief work is a free, and it must be confessed tedious, version of the *De Regimine Principum* of Egidius Romanus, over five thousand lines in length, and written in Chaucer's seven-line stanza. A prologue, about one-third of the whole in length, begins the work, and here the author tells us a good deal about himself and his troubles. The most interesting passage is that in which he speaks out his grief for the death of his great master Chaucer, the 'floure of eloquence' and 'mirrour of fructuous entendement.' The poem was edited by T. Wright for the Roxburghe Club in 1860. Many other poems are ascribed to Hoccleve, some still unprinted. Some of these are stories from the *Gesta Romanorum*, as that of Jonathas, son of King Darius, and the wicked woman, which was modernised by W. Browne and printed in his *Shepheards Pipe* (1614), where he pays his original a most graceful poetical compliment far beyond his deserts. His *Minor Poems* and his *Complcint* have been edited by Dr Furnivall for the Early English Text Society.

Hoche, LAZARE, one of the most eminent generals of the French Republic, was born of poor parents, 25th June 1768, at Montreuil, a faubourg of Versailles. Enlisting at sixteen, he rapidly obtained promotion by his courage and capacity, and was given in 1793 the command of the army of the Moselle, for his defence of Dunkirk against the Duke of York. Here he tried to cut off the communication between the Prussians and Austrians, and, although foiled by the superior forces of the Duke of Brunswick, yet managed to drive the Austrians out of Alsace. His next important service was putting an end to the civil war in La Vendée, which he accomplished with great prudence and moderation. He was appointed to command the troops in the unfortunate expedition for the conquest of Ireland (1796), but the ships were soon scattered by the storms. Soon after he was placed in command of the army of the Sambre and Meuse. On the 18th April 1797 he crossed the Rhine at Neuwied, and had defeated the Austrians in several battles, when his career was stopped by the armistice concluded between the Archduke Charles and Bonaparte at Leoben. After the 18th Fructidor he was suddenly taken ill in the camp at Wetzlar, and died, 18th September 1797. There are Lives by Rousselin (1798), Dourille (1844), Desprez (1858), and Dutemple (1879).

Hochelaga. See MONTREAL.

Hochheim, a town of Prussia, in Hesse-Nassau, on the right bank of the Maine, 3 miles E. of Mainz. Here is produced the excellent white wine known as *Hochheimer*, whence was derived, before 1625, the English name *Hock*, now applied loosely to almost any white Rhenish wine. Pop. 2804.

Hochkirch, or HOCHKIRCHEN, a village in Saxony, a few miles E. by S. from Bautzen, was the scene of a battle between the Austrians and Prussians (14th October 1758) during the Seven Years' War. Frederick II., with an army of 30,000 strong, was attacked under cover of a thick fog by Marshal Daun, with 65,000 Austrians, and compelled to retire to the heights of Drehsa. Frederick lost 9000 men killed and wounded and 101 cannon. He and most of his generals were wounded, and Marshal Keith and Prince Francis of Brunswick were killed. The Austrians lost 6000 men.

Höchstädt. See BLENHEIM.

Hock. See HOCHHEIM, WINE.

Hocktide, or HOKETIDE, a popular anniversary which used to be celebrated on the Monday and Tuesday following the second Sunday after Easter. On one day, generally on the Tuesday, the women held the roads and streets, and stopped all men who came their way, and having bound them with cords, only set them at liberty after they had paid a small sum of money. On the other day the men had their turn, and collected from the women. The custom goes back to the 13th century, but became obsolete in the 18th. For a curious survival or reminiscence of the custom still practised at Hungerford, in Berkshire, see *Chambers's Journal*, 1888.

Hodeida, a seaport of Yemen, in Arabia, situated on the Red Sea, whence are exported coffee, hides, cattle, fruits, and mother-of-pearl. Pop. about 20,000.

Hodge, CHARLES, an American theologian, was born in Philadelphia, 28th December 1797. He graduated at Princeton College in 1815, and in 1822 became a professor in the Princeton Theological Seminary, where he remained till the close of his life. He was founder and long the editor of the *Princeton Review;* and besides numerous essays, &c., he was the author of commentaries on Romans, Corinthians, and Ephesians, of a history of the Presbyterian Church in America (1840), and of the well-known *Systematic Theology* (3 vols. 1871–72), now a standard work of the Calvinistic churches. In 1872 he was presented with a sum of $15,000, and a professorship bearing his name was founded in his honour. He died 19th June 1878. See *Charles Hodge*, by E. L. Patten (1889).—His son, ARCHIBALD ALEXANDER (1823–86), succeeded his father at Princeton in 1878. He wrote *Outlines of Theology* (1860), works on the Atonement and the Confession of Faith, and a Life of his father (1880). His *Popular Lectures* were published in 1887.

Hodgkin, THOMAS, D.C.L., born of Quaker stock at Tottenham in 1831, became a banker in Newcastle, but is known for *Italy and her Invaders* (vols. i.–vii. 1880–99) and other learned works.

Hodgkinson, EATON (1789–1861), a Manchester engineer, became the great authority on iron beams, and was professor of Engineering in University College, London.

Hodgson, BRIAN HOUGHTON (1800–95), orientalist, was born near Macclesfield, entered the East India Company's service in 1818, was Resident in Nepal from 1820 to 1843, and settled in England in 1858. He wrote some 170 very valuable papers on the ethnology, languages, and zoology of Nepal and Tibet, sent home 354 MSS., on which our knowledge of northern Buddhism is mainly based, and made a collection of 10,500 birds. He was F.R.S., &c. See Life by Sir W. Hunter (1896).

Hodograph (Gr. *hodos*, 'a way') of a moving particle is the curve passing through the extremities of those lines which, drawn from a fixed point as origin, represent in direction and magnitude the velocities of the particle at the different points of its path. It is a velocity diagram of a particular kind. Just as the tangent to the path at any point gives the direction of motion of the particle at that point, so the tangent to the hodograph at the corresponding point gives the direction in which the velocity is changing —i.e. the direction of the acceleration. Thus, if the hodograph is a straight line with origin anywhere outside it, we see that the acceleration is constant in direction, for a straight line is its own tangent. Another conclusion at once deducible is that the velocity resolved perpendicular to the direction of the acceleration is always the same, being given by the perpendicular from the origin upon the line. If, in this case, the acceleration is also constant in amount, we obtain the hodograph of the parabolic motion of a projectile. As another simple case, let the hodograph be a circle, centre the origin. Here the speed of the particle in its path must be constant; and further, the acceleration is perpendicular to the velocity, having the effect of changing the direction only of motion. If, in this case also, the acceleration is given as constant in amount, then the line representing the velocity in direction must rotate uniformly. Hence the path must be such that the angle between the tangents at two points must be proportional to the length of the arc joining them. In technical language, the path must be a plane curve of constant curvature—i.e. either a straight line or a circle, obviously the latter in this case. Thus, under an acceleration constant in amount and always perpendicular to the direction of motion, and to a fixed direction in space, the particle will describe a circle with constant speed, the radius of the circle being a third proportional to the magnitude of the acceleration and the speed. The name hodograph was invented by Sir W. R. Hamilton, who made many elegant applications of its properties to dynamics. In virtue of the aberration of

light, every star describes a projection of the hodograph of the earth's motion in its orbit—i.e. the projection of a circle. The properties of the hodograph are treated in all modern treatises on the dynamics or kinematics of a particle.

Hodometer. See PEDOMETER.

Hodson, MAJOR WILLIAM STEPHEN RAIKES, English soldier, usually known as Hodson of Hodson's Horse, was born at Maisemore Court, near Gloucester, on 19th March 1821. Choosing the life of a soldier, he joined the Indian army in 1845, and immediately got his first experience of warfare in the battles of the first Sikh war. In 1847 he was appointed second in command of the Punjab corps of Guides, a body of irregular native troops raised for the protection of the north-west frontiers of India against the marauding hill-tribes. From 1849 to 1852 Hodson was employed in the work of civil government in the Punjab. Then, being made commandant of the Guides corps, he did excellent service on the turbulent frontier. But in 1856 he was deprived of his command on account of irregularities in the regimental accounts and of his unjust treatment of the troops and natives under his authority. In the crisis of the Mutiny, however, he was appointed head of the intelligence department in the army engaged before Delhi, and was commissioned to raise a new regiment of irregular cavalry, which became known as Hodson's Horse. With this body of men Hodson took part in the siege of Delhi and in the subsequent operations down to the siege of Lucknow. After the fall of Delhi Hodson discovered the Mogul sovereign and his sons; these last he shot dead with his own hand at the time of capture. He himself was shot on 11th March 1858, during the assault on a royal palace in Lucknow, and died on the following day. As a leader of irregular native soldiery, Hodson won unqualified praise for his boldness and skill; his wild troopers were warmly attached to him. But he seems to have been of an imperious temper, which sometimes led him to commit acts of violence and injustice. In money matters he was certainly irregular; and he has been accused of 'looting' in war.

See Rev. G. Hodson's *Hodson of Hodson's Horse* (4th ed. 1883); and compare R. Bosworth Smith's *Life of Lord Lawrence* (especially appendix to vol. ii., 6th ed. 1885), and T. R. E. Holmes's *Four Famous Soldiers* (1889), though none of the three is absolutely satisfactory in his estimate of Hodson's character.

Hoeven. JAN VAN DER, Dutch naturalist, was born on 9th February 1801, at Rotterdam. After studying medicine at Leyden, and zoology at Paris, he established himself as a physician in his native town; and in 1835 he was elected to the professorship of Zoology at Leyden. He died on 10th March 1868. His most important work is *Handboek der Dierkunde* (1827-33), of which a second edition, entirely recast, appeared in 1846, and an English translation by Clark, with important additions by the author and the editor, in 1856-58. Most of his other works are memoirs.—His brother, CORNELIS PIETER VAN DER HOEVEN (1792-1871), was professor of Medicine in the university of Leyden (1824-71), and the author of *De Historia Medicinæ* (1842), *De Historia Morborum* (1846), and other important works on pathology and the history of medicine.

Hof, a town of Bavaria, on the Saale, 30 miles NE. of Baireuth, has extensive manufactures of ironwares, cottons, and woollens; cloth has been made here since the 15th century. There is a hospital, founded in 1262. Hof, almost entirely rebuilt since its destruction by fire in 1823, is closely associated with Jean Paul's earlier years. Pop. (1875) 18,267; (1890) 24,445.

Hofer, ANDREAS, the patriot leader of the Tyrolese in 1809, was born at St Leonhard, in the valley of Passeier, on 22d November 1767. For a century and a half his forefathers had been landlords of the inn 'Am Sand.' Although little higher in the social scale than a peasant, his force of character was such that, when in 1809 he summoned the people of the Tyrolese valleys to arms to drive out the French and the Bavarians, they responded with alacrity and enthusiasm, eager to show their love for their emperor and the holy church. In seven weeks he twice defeated the Bavarians, twice expelled them from Innsbruck, and finally swept them clean out of the Tyrol. As the armistice concluded between Austria and France after the battle of Wagram left Tyrol and Vorarlberg out in the cold, the French again inundated their valleys with some 40,000 men. But again Hofer in eight days routed the foe and retook Innsbruck. For the next two months Hofer was the actual military governor and civil ruler of his native land. By the peace of Vienna (October 14) the emperor of Austria again left Tyrol and Vorarlberg at the mercy of his enemies. Hofer, after some hesitation as to the wisdom of submission, once more took up arms; but this time the French and Bavarians were too strong for him. They steadily subdued one valley after another; and Hofer, seeing that the struggle was hopeless, disbanded his followers and took refuge in the mountains in the end of November 1809. But two months later his hiding-place was betrayed to the French, and Hofer was captured on 27th January, carried to Mantua, tried by court-martial, and shot on 20th February 1810. The 'Sandwirth' or 'landlord of the Sand' still lives in the memory of his people, and is the hero of many patriotic ballads. His statue, by Schaller, stands in Innsbruck.

See Hormayr, *Das Land Tirol* (1845); Egger, *Geschichte Tirols*, vol. iii. (1880); and memoirs by Wolfsgruber (3d ed. 1864), Hegel (1874), and Stampfer (1874).

Hoffmann, AUGUST HEINRICH, commonly called HOFFMANN VON FALLERSLEBEN, poet and philologist, was born 2d April 1798, at Fallersleben, in the district of Lüneburg. At Göttingen and Bonn he occupied himself with philological and literary studies, especially the study of his native language and literature. From 1830 to 1838 he was keeper of the university library of Breslau, and professor of the German Language there from 1835. The publication of his *Unpolitische Lieder* (Unpolitical Lays) in 1842 cost him his professorship. For some years he led a wandering life in Germany, Switzerland, and Italy, until in 1860 he became librarian to the Duke of Ratibor at the castle of Korvei, on the Weser, where he died on 19th January 1874. His principal philological and antiquarian works are *Horæ Belgicæ* (1830-62), *Reinke Vos* (1834), *Geschichte des Deutschen Kirchenliedes* (1832; 3d ed. 1861), collections of ancient German Political (1843) and Social (1844) songs, *Specimen zur Deutschen Literaturgeschichte* (1844), *Die Deutsche Philologie* (1836), and *Findlinge* (1859-60). Hoffmann's own poetry often approaches good *Volkslieder* in its simplicity, tenderness, and playful banter; and for these songs he produced many admirable tunes. His political poetry contributed to the preparation of the political fermentation of 1848. The *Gedichte* appeared in 1834 (8th ed. 1875), and he published numerous collections of songs, as *Allemannische Lieder*, *Soldatenlieder*, *Kinderlieder*, &c. He wrote an autobiography in 6 vols. (*Mein Leben*, 1868-70). See Wegner's *Hoffmann von Fallersleben* (1869-70), and Gottschall, *Porträts*, vol. v. (1876).

Hoffmann, ERNST THEODOR WILHELM, German writer, musical composer and critic, and

caricaturist, was born at Königsberg on 24th January 1776. (Later in life, to show his admiration of Mozart, he substituted for Wilhelm the name Amadeus.) Hoffmann qualified himself for a legal career, and in 1779 was appointed assessor in a court at Posen. But his irrestrainable love of caricature got him into trouble with his superiors, and he was degraded to an inferior post at Plock. Recovering ground again, for he was all his life long most exemplary in the discharge of his official duties, he was transferred to Warsaw (1804); but the occupation of that city by the French two years later threw him entirely out of office. For the next ten years he led a very precarious existence, being often on the verge of want, yet always painting, composing music, and leading a wild and merry life. His great ideal was to live for and by art, especially music, and in 1808 he was for two months director of the theatre at Bamberg. During these same years he wrote a remarkable essay on Mozart's *Don Juan*, and composed an opera on Fouqué's *Undine*. In 1815 he was enabled to resume his career in the service of Prussia; and from 1816 down to his death in 1822 (25th June) he held a high position in the supreme court at Berlin.

His career as an author did not properly begin until 1814. But his tales cannot be rightly understood without some acquaintance with the strange personality of the writer—a little restless man, with a Roman nose and thin lips, and hawk-eyed, a brilliant talker, full of drollery and wit, vain, wayward, fantastic to an extreme, the child of impulse, and the bond-slave of his wild imagination. Educated on the dreams and ideals of German romanticism at the period of its most exuberant growth, he became himself the arch-priest of ultra-German romanticism. At Posen, at Warsaw, at Bamberg, and in his last years at Berlin, he was the brilliant centre of the literary and artistic Bohemianism of the place. Amid the riot and revelry at Posen he learned two of the lasting lessons of his lifetime, to wit, that company—amusing company—and much rum were essential to his happiness. A fierce hater of dullness, Hoffmann waged incessant war upon the stiff-necked sticklers for routine and commonplace conventionalism, and upon the dilettanti who dealt so glibly in the phrasemongery of art-criticism. His wit constantly bubbled over in irony, ridicule, sarcasm, and was often both savage and malicious. His imagination was inexhaustible, but utterly undisciplined, wild, and fantastic, yet wonderfully vivid. Apart from music and painting, nothing fettered his interest so keenly as the extravagant and the marvellous, the grotesque, the weird, and the horrible. An impressionist above all things, Hoffmann's literary strength lies in his power of graphic and vivid description: he describes what he actually saw and felt, and he describes, as a painter paints pictures, in the spirit of concrete realism. He used to affirm that he did actually see the imps and hobgoblins and nightmare apparitions which his perfervid imagination conjured up before him. In short, Hoffmann's tempest-tossed soul was put in such jeopardy by his uncontrollable imagination, conjoined with his lack of firm principle, that it barely escaped being wrecked upon the rock of insanity.

His shorter tales, upon which his reputation as a writer mainly rests, were mostly published in the collections entitled *Phantasiestücke in Callot's Manier* (1814), *Nachtstücke* (1817), and *Die Serapionsbrüder* (1819–25). His longer works include *Elixiere des Teufels* (1816; Eng. trans. 1824), *Seltsame Leiden eines Theaterdirektors* (1818), *Klein Zaches* (1819), and *Lebensansichten des Katers Murr* (2 vols. 1821–22), this last being partly autobiographical. Of his fairy tales *Der Goldene Topf* was translated by Carlyle (1827). Hoffmann's *Ausgewählte Schriften* appeared in 10 vols. in 1827–28, the latest and the most complete edition of his *Gesammelte Schriften* in 15 vols. in 1879–83. Collections of his tales have been translated into English in 1826 (Gillies), 1885, with biography (Bealby), and 1886 (Ewing). His writings, and translations and imitations of them, have been very popular in France. See Hitzig, *Hoffmann's Leben* (1823); Funck's *Erinnerungen* (1836); and Carlyle's *Miscellaneous Essays*, vol. i.

Hoffmann, Friedrich, a German physician, was born at Halle, 19th February 1660, and died in that city, 12th November 1742. On the conclusion of his studies at Jena and Erfurt he commenced practice at Minden in Westphalia in 1685, but three years later removed to Halberstadt. In 1693 he was appointed to the professorship of Medicine in the newly-constituted university of Halle. He gained a European reputation as a practitioner, and was body physician to Frederick I. of Prussia. His medical theories are now for the most part antiquated, though some of his pharmaceutical preparations, once highly esteemed, are still in use. The most important of his works, *Medicina Rationalis Systematica* (9 vols. 4to), was published in 1718–40. His *Opera Omnia* were printed at Geneva in 1740, in six folio volumes, with three supplementary volumes in 1753–60.

Hofhuf, one of the chief towns of the Arabian district of El-Hasa, situated a short distance inland, over against the islands of Bahrein in the Persian Gulf. It has a fortress, believed to have been built by the Carmathian princes. It has been in the hands of Turkey since 1872. Pop. 25,000.

Hofmann, August Wilhelm, chemist, was born at Giessen, 8th April 1818. After obtaining the degree of doctor of philosophy, he became assistant to Liebig in the laboratory at Giessen. When the Royal College of Chemistry was established in London in 1845 Hofmann was, on Liebig's recommendation, made superintendent of the new institution; and from 1856 to 1865 he was chemist to the royal mint. In 1865 he went to Berlin as professor of Chemistry. His contributions to the scientific journals here and in Germany are mainly on organic chemistry. It was in the course of these researches that from coal-products he obtained aniline (see Aniline, Dyeing). He devoted much time and labour to the development of the theory of chemical types. His *Introduction to Modern Chemistry* (1865; 7th ed. 1877) led to great reforms in the teaching of chemistry. He wrote on *The Life-work of Liebig* (1876), and, in German, on the work of the chemists Wöhler (1883) and Dumas (1885), as also *Chemische Erinnerungen* (1882). Ennobled in 1888, he died 5th May 1892.

Hofmann, Johann Christian Karl, theologian, was born at Nuremberg, 21st December 1810, studied at Erlangen and Berlin, and having been *docent* and extra-ordinary professor of Theology at Erlangen, was called as professor to Rostock, whence, in 1845, he returned to Erlangen. He was ennobled in 1857, and died 20th December 1877. In his numerous works he maintained an unswerving Lutheranism, the chief being the work on prophecy (*Weissagung und Erfüllung*, 1841–44) and the defence of Christianity from its records, *Der Schriftbeweis* (1852–56; 2d ed. 1857–60).

Hog. See Boar (Wild), Pig. In Scotland a sheep that has not yet lost its first fleece is called a Hog or Hogg; a sheep two years old is a Hogget.

Hogarth, William, a celebrated painter, engraver, and pictorial satirist, born in Bartholomew Close, London, on the 10th November 1697, served his apprenticeship to a silversmith named Ellis Gamble, in Cranbourne Alley, Leicester Fields, and studied art at Sir James Thornhill's school in

James Street, Covent Garden. About 1720 he set up for himself. His first employment was to engrave coats of arms, crests, shop bills, &c., after which he began to design plates for the booksellers, the chief of which are the illustrations to Gray's edition of *Hudibras* (1726). He next tried his hand at portrait painting, and soon had ample employment for what are called 'conversation pieces,' but he never cared greatly for this branch of art. In March 1729 he married clandestinely the daughter of Sir James Thornhill, and shortly afterwards began to display his extraordinary faculty for depicting the vices and follies of his time. In 1730–31 he painted 'A Harlot's Progress,' a series of six pictures which, like many of his other works, was engraved by himself. It was published in April 1732. The 'Harlot's Progress' was followed by other moral histories and satiric delineations, such as 'A Midnight Modern Conversation' (1734), 'Southwark Fair' (1735), 'A Rake's Progress' (1735), 'The Distressed Poet' (1736), 'The Four Times of the Day,' and the 'Strolling Actresses dressing in a Barn' (1738). Concurrently with these Hogarth made more than one attempt to compete with the popular history-painters of his day, and with far less success produced the large canvases still in St Bartholomew's Hospital—the 'Pool of Bethesda' and the 'Good Samaritan,' both executed in 1736; and he also produced several portraits. The series of graphic satires was, however, continued by the 'Enraged Musician' (1741) and the famous 'Marriage à la Mode' (his masterpiece), six pictures now in the National Gallery, and engraved by various hands in 1745. 'Industry and Idleness,' twelve plates, followed these in 1747; 'Calais Gate, or O the Roast Beef of Old England!' (1749) came next, and in 1750 the fine plate known familiarly as the 'March to Finchley.' The minor plates of 'Beer Street' and 'Gin Lane' and the set called 'The Progress of Cruelty' belong to 1751. In 1752 he published the *Analysis of Beauty*, a treatise containing many shrewd remarks, but confused and illiterate in its style. It had only a *succès d'estime*. After this he returned to his graver, producing (with the aid of Grignion and others) the four prints of the 'Election Series' (1755–58), the 'Cockpit' (1759), and other pieces. In 1757 he was appointed sergeant-painter to the king. In 1762–63 an unhappy excursion into politics involved him in a miserable quarrel with Wilkes and Churchill, the result of which, on his side, was the well-known portraits of Wilkes, and of Churchill as a bear ('The Bruiser'). By this time his health was failing. He composed a tail-piece to his works, 'Finis, or the Bathos,' March 1764; and in October of the same year died at his house in Leicester Fields. He was buried in Chiswick churchyard, under an epitaph by Garrick. Not far off still stands the little villa which he long occupied as a summer residence.

There are portraits of Hogarth by himself in the National and National Portrait Galleries, and most of his pictures, which now enjoy a much higher repute for technique than formerly, are preserved in public or private collections in Britain. His powers of invention and combination were extraordinary; and as a humorist and social satirist with the pencil he has never been surpassed. There can be no doubt also that he genuinely desired to assist by his work in the reformation of manners.

His prints can be studied in the collections of Boydell (1790), or of Bradbury and Cradock (1820–22). Biographical studies of him have been published by G. A. Sala (1866) and the present writer (1889–92). The best commentaries on his engravings are to be found in John Ireland's *Hogarth Illustrated* (1791–98); Lichtenberg's *Ausführliche Erklärung* (revised edition, 1850–53); Nichols and Stevens' *Genuine Works* (1808–17); and E. G. Stephens' *Catalogue of the Satirical Prints and Drawings in the British Museum*, vols. ii. iv.

Hogg, JAMES, Scottish poet, was born, in a cottage near the parish church of Ettrick, Selkirkshire, in the year 1770. The exact date of his birth is unknown; and rather singularly he himself asserted it to have been the 25th January 1772. It is beyond question, however, that he was baptised on 9th December 1770. He was the second son of Robert Hogg, farmer and shepherd, by Margaret Laidlaw, who was a distant relative of William or 'Willie' Laidlaw, the amanuensis of Sir Walter Scott and author of 'Lucy's Flitting.' Hogg's education was conducted in a very irregular fashion, owing to his being taken from school at intervals to help his father in tending sheep. His schooling according to his own statement—amounted in all to about six months: he learned to read the Bible, but not to write. Meanwhile, however, his mother had filled his imagination by telling him 'tales of kings, giants, knights, fairies, kelpies, brownies, &c.' In the intervals of work he seems to have educated himself, and when he was about sixteen years of age a perusal of *The Gentle Shepherd* and *Life and Adventures of Sir William Wallace* kindled his poetical fancy. Hogg himself says, however, that it was not till 1796 that he attempted to write verses, and 'for several years his compositions consisted wholly of songs and ballads, made up for the lasses to sing in chorus.' In 1800 one of his poems, 'Donald M'Donald,' having for its subject the threatened invasion of Great Britain by the first Napoleon, was published anonymously. The following year, having visited Edinburgh to sell his employer's sheep, he had printed in pamphlet form *Scottish Pastorals, Poems, Songs, &c.* Of this small volume a thousand copies were thrown off, but no impression was made upon the public by it. At this time Hogg contemplated emigration to the island of Harris, and wrote a 'Farewell to Ettrick.' His scheme fell through, but he was fortunate enough to make the acquaintance of Sir Walter Scott—then Mr Scott, sheriff of Selkirkshire. Having written out several ballads from his mother's recitation, he sent them to Scott, who gave them a place in the third volume of his *Border Minstrelsy*, which appeared in 1803. The same year Constable, acting on Scott's advice, published a volume of verse entitled *The Mountain Bard*, and also a treatise of a different kind entitled *Hogg on Sheep*. The two between them brought him £300, which he sunk in a farm that proved a total failure. After several years of vicissitude, in which he tried, without success, to run large stock farms, Hogg repaired to Edinburgh and entered definitely on a literary career. He published in 1810 a second volume of poems, *The Forest Minstrel*, which proved a failure, and started a weekly paper, *The Spy*, which lasted for a few months. Meanwhile he seems to have gone into business as a land-agent, but here again to have met with no success. In 1813, however, he published his greatest work, *The Queen's Wake*, and at once obtained cordial recognition from the critics, Jeffrey declaring in the *Edinburgh Review* that 'no doubt can be entertained that he is a poet in the highest acceptation of the term.' Hogg had made the friendship of Harriet, Duchess of Buccleuch, and in accordance with her death-bed request her husband granted him, on the payment of a nominal rent, one of his farms known indifferently as Mossend, Eltrive Lake, or Altrive. Had he given himself up to this farm and to literature Hogg would probably have been a well-to-do as well as a happy man. But he hampered himself by taking the neighbouring farm of Mount Benger, and was more or less in pecuniary difficulties to the end of his days. He was very happy,

however, in his domestic life. In 1820 he married Margaret Phillips, the daughter of a tenant-farmer in Annandale, whom he had met at the house of her brother in-law, Mr Gray, one of the teachers in the High School of Edinburgh. She proved an admirable wife, although she was some twenty years younger than her husband. Hogg now produced in rapid succession a number of works both in verse and prose. Of the former the chief are *Madoc of the Moor*, *The Pilgrims of the Sun*, *Queen Hynde*, and the *Border Garland*; of the latter *The Brownie of Bodsbeck*, *Winter Evening Tales*, *The Three Perils of Man*, and *The Three Perils of Woman*. It seems doubtful whether he was the sole author, or along with Lockhart the joint-author, of the remarkable *Confessions of a Justified Sinner*, otherwise known as *The Private Memoirs and Confessions of a Fanatic*, published in his name. Hogg was at this time a well-known figure in Edinburgh society; was the intimate friend of Professor Wilson, Sir Walter Scott, and Lockhart, although he had his differences with all three; wrote considerably for *Blackwood's Magazine*, and was the basis of the famous 'Shepherd' of the *Noctes Ambrosianæ*. In the end of 1831 he paid a visit to London to arrange for the publication of a complete edition of his works. He remained for some weeks in the metropolis; was entertained to dinner by the Highland Society of London, and in other ways lionised. He died at Altrive, November 21, 1835.

Hogg once described himself to Scott as 'the king of the Mountain and Fairy School' of poetry, and this definition, egotistic though it is, holds good so far as Scotland is concerned. Of his masterpiece, 'Kilmeny,' a leading critic of to-day, Professor Saintsbury, has said that it is 'such poetry as, to take Hogg's contemporaries only, there is none in Rogers or Crabbe, little, I fear, in Southey, and not much in Moore.' Some of his ballads, such as 'The Witch of Fife,' and a few of his songs, especially 'When the Kye Comes Hame,' belong to the immortal part of Scottish if not of English literature. The late Professor Ferrier's description of Hogg as 'after Burns (*proximus sed longo intervallo*) the greatest poet that had ever sprung from the bosom of the common people' is now the universally accepted verdict of criticism. Hogg's prose is much more unequal than his poetry; a strong though coarsish humour is its most notable characteristic.

The chief authorities on the life of Hogg are his autobiography and *Memorials of James Hogg, the Ettrick Shepherd*, edited by his daughter, Mrs Garden (1885). Professor Wilson prefixed a short Memoir of Hogg to an edition of his works published after his death. Another edition in two large volumes by T. Thomson appeared in 1865. The Memoir of Dr Robert Chambers by Dr William Chambers throws light on Hogg's life in Edinburgh; and see Mrs Oliphant's *William Blackwood and his Sons* (1897). A notable recent criticism of Hogg is Professor Saintsbury's in his *Essays in English Literature* (1890).

Hogmanay, a name applied in Scotland to the last day of the year, the 31st of December, often celebrated with holiday festivities in connection with the New-year's Day. In the Scotland of former days it marked the commencement of a holiday of uproarious joviality, a kind of annual Saturnalia, in which the New Year was ushered in with the most boisterous revelry, accompanied by many quaint and time-honoured ceremonies. The origin of this name is altogether uncertain, and many idle etymologies have been offered. These the curious will find in Chambers's *Book of Days*.

Hog-nut. See Cob-nut.

Hog Plum, a name given in the West Indies to the fruit of certain species of Spondias trees and shrubs of the natural order Anacardiaceæ, also called Spanish Plum and Brazilian Plum. *S. purpurea* and *S. lutea* are the species generally called Hog Plum in the West Indies, because their fruits are a common food of hogs, which revel in their abundance. A much-esteemed Brazilian dish is prepared of milk, curds, sugar, and the pulp of the fruit of *S. tuberosa*, from which also a refreshing beverage is made for use in fevers.

Hog-rat, or Hutia (*Capromys*), a genus of porcupine like rodents (Hystricomorpha) of the family Octodontidæ. The body is from 20 to 22 inches long, covered with long very harsh fur, consisting of a mixture of black and yellow hairs; the tail is stout and rounded and slightly hairy, and is used for support in sitting erect or for aid in climbing trees. They are nocturnal or crepuscular animals; their food is almost entirely vegetable. Three species are known, two inhabiting Cuba, and one Jamaica, where they are found in large numbers in the dense forests on trees or in thick underwood. The negroes use them for food, capturing them by snaring or hunting them with dogs.

Hogshead, an old English measure of capacity, no longer in use, but equivalent for wine to 63 gallons, for ale and beer to 51 gallons. In the United States the word now signifies a large cask.

Hogue, Cape La. See La Hogue.

Hohenlinden, a village of 300 inhabitants in Upper Bavaria, 20 miles E. of Munich, famous for the victory gained there by 70,000 French under Moreau over 60,000 Austrians under the Archduke John, 3d December 1800. Moreau's army took up a position on the plateau between the Isar and the Inn, and the Austrians on the right bank of the Inn. The Austrian main body advanced amidst drifting snow, and attacked the divisions of Grénier and Grouchy with the utmost fury; but, the French receiving considerable reinforcements under Ney, the assailants were driven back, and, being attacked in the rear, were totally routed. The victory was likewise decided at other points in favour of the French, who were only prevented from pursuit by inclement weather, bad roads, and the short winter day. The Austrians and their Bavarian allies lost 17,000 men and 74 guns; the French had 5000 killed and wounded. Campbell's immortal lyric will keep the details of this battle from ever being forgotten. See Schleifer, *Die Schlacht bei Hohenlinden* (1885).

Hohenlohe, a former German principality in Franconia, now comprised chiefly in Würtemberg, partly also in Bavaria.

Hohenschwangau, a royal castle in Bavaria, 55 miles SW. of Munich, near the right bank of the Lech, and the southern frontier of the kingdom. It stands in a beautiful and romantic district, 2933 feet above sea-level. It was purchased in 1832 by the crown-prince Maximilian of Bavaria, who restored it in the style of a magnificent medieval feudal castle. The interior contains several superb halls decorated with frescoes and wall-paintings by eminent German artists. A castle called Schwanstein occupied the same site as early as the 12th century; a second was erected in 1538–47; and the existing building is the third castle. On another crag over against Hohenschwangau stands the castle of Neuschwanstein, which was built in 1869–71 on the site of the castle originally called Hohenschwangau by King Louis of Bavaria, in the Early Romanesque style. This castle too, a most magnificent and 'romantic' structure, contains superb wall-paintings, and displays the utmost splendour in its internal fittings. It was for some time the favourite residence of the recluse king, Louis II. See Zwickh, *Herrenchiemsee und Neuschwanstein* (1886).

Hohenstaufen, a German princely house, members of which held the imperial throne from 1138 to 1254. The founder of the family was FREDERICK VON BUREN, who lived about the middle of the 11th century. His son Frederick assumed the name of Hohenstaufen from a castle which he built on the hill of Staufen (2240 feet), 25 miles E. of Stuttgart. He was invested with the duchy of Swabia by the Emperor Henry IV., and during the absence of the latter in Italy acted as vicegerent of the empire. Frederick, at his death in 1105, left two sons, Frederick II. the One-eyed, and Conrad. The former was confirmed in the duchy of Swabia; and in 1112 the latter received the duchy of Franconia. After the death of Henry V. this emperor's family estates fell to the House of Hohenstaufen; and Lothaire of Saxony was elected his successor in the empire. Lothaire revoked the grants made to the Hohenstaufens, and thus gave rise to a furious war, in which Frederick (his brother Conrad being absent in the Holy Land) had to encounter, single-handed, the whole power of the emperor, the House of Zähringen, and Henry the Proud, Duke of Bavaria and Saxony. After Conrad's return fortune at first seemed to favour the brothers, but in 1135 they were compelled to submit and plead for the emperor's forgiveness. They were then put in possession of all their estates. Conrad, in 1138, was elected emperor of Germany as Conrad III. The succeeding emperors of this family were Frederick I. (1152-90), Henry VI. (1190-97), Philip I. (1198-1208), Frederick II. (1212-50), and Conrad IV. (1250-54). Manfred, half brother of the last named, lost his life in the battle of Benevento (1266), whilst asserting his rights to the throne of the Two Sicilies; and Conradin, son of Conrad IV., was put to death (1268) by Charles of Anjou for carrying on the struggle. See Raumer, *Geschichte der Hohenstaufen* (5th ed. 1878); GERMANY; and the articles on the several emperors.

Hohenstein, a Saxon town, with textile industries, 12 miles NE. of Zwickau. Pop. 6827.

Hohenzollern, two united principalities (Hechingen and Sigmaringen) of south Germany, but belonging to Prussia, consist of a narrow strip of land entirely surrounded by Würtemberg and Baden. Area, 441 sq. m.; pop. (1890) 66,085, mostly Roman Catholics. The territory, whose surface is generally mountainous, stretches south-east from the Black Forest, across the Neckar and the Danube. The principal industries are agriculture and the rearing of cattle. Iron ore, gypsum, salt, and coal exist, as well as some mineral springs. The seat of government is Sigmaringen (4146).

The Hohenzollern family traces its descent from Count Thassilo, who lived about the beginning of the 9th century, and founded a castle near Hechingen, on the Zollern hill in the Swabian Alb, whence his descendants derived their patronymic. About 1165 the first separation took place, Frederick IV. founding the elder or Swabian and Conrad III. the younger or Franconian line. The elder line was subdivided, in 1576, into the branches of Hechingen and Sigmaringen. Frederick VI., the representative of the younger line, in 1415 received from the Emperor Sigismund the investiture of the electorate of Brandenburg, thus founding the reigning dynasty of Prussia. The two branches of the elder line continued unbroken till 1849, when the reigning princes ceded their respective rights and principalities to the king of Prussia, who agreed to pay them annual pensions. See GERMANY, Vol. V. p. 184.

Hoist. See LIFTS.

Hokitika, the capital of Westland, New Zealand, and the chief town on the west coast, is the chief centre of a gold-producing and agricultural district. Pop. 2178.

Hokusai. See JAPAN.

Holacanthus, a genus of fishes, in characters and distribution similar to the Chætodons (q.v.). They are remarkable for the great beauty and symmetry of their colours, and for their excellence as articles of food. The body is compressed, and the gill-cover bears a strong spine. One of the best known of the forty species, called *Emperor of Japan* by the Dutch, is *H. imperator*, one of the most esteemed fishes of the East Indies, rivalling the salmon in flavour. Its greatest size is about 15 inches long; its colour is deep blue, with numerous narrow bands of orange, the pectoral fins black, the tail bright yellow. In beauty it is rivalled by an allied species, *H. diacanthus*, of similar distribution.

Holbach, PAUL HEINRICH DIETRICH, BARON D', philosopher, and one of the French encyclopædists of the 18th century, was born of wealthy parentage, at Heidelsheim, in the Palatinate, in 1723. At an early age he went to Paris, where he continued to reside during the remainder of his life. He died 21st June 1789. As Holbach was remarkable for his agreeable social qualities, and kept a good table, the most eminent thinkers and writers of the day, such as Condorcet, Diderot, Duclos, Helvétius, Raynal, Rousseau, Buffon, &c., were in the habit of assembling at his house. The witty Abbé Galiani called Holbach the *maître d'hôtel* of philosophy. Here speculation, it is said, was carried to such daring lengths that Buffon, D'Alembert, and Rousseau were compelled to withdraw from the circle. Holbach was the zealous champion of naturalism, and contended not only against Christianity, but against every positive religion. His principal work is the *Système de la Nature* (2 vols. 1770). In it the author endeavours to expound the natural principles of morality, and to investigate the origin of the conflicting opinions on virtue and vice. He discusses the maxims of religious morality, and takes a rapid survey of social and savage life. He touches on the so-called 'social compact,' and in the course of his observations tries to prove, among other things, that self-interest is the ruling motive of man, and that God is only an ideal being, created by kings and priests. The materialism of the French *philosophes* of the 18th century is nowhere more pernicious and paltry than in the writings of Holbach. It is but fair to state that his life was better than his books. He was a man of good heart, and, in spite of his theories, of most unselfish benevolence. When the Jesuits fell into disgrace during the reign of Louis XV., Holbach, though he hated their system, and had written against them in the days of their prosperity, made his house an asylum for his old foes when the clouds gathered round them. See an article by J. Morley in the *Fortnightly*, 1877.

Holbeach, a market-town of south Lincolnshire, 7½ miles by rail ENE. of Spalding. It has a fine Decorated church, with a spire 189 feet high; and Roman remains have been found here. Pop. of parish (1851) 5191; (1881) 5190.

Holbein, HANS, the younger, one of the most celebrated of painters, was born at Augsburg in 1494 or (more likely) 1495, the son of Hans Holbein the elder (*c.* 1460-1524), also a painter, and known by such works as 'The Basilica of St Paul,' now in the Augsburg Gallery. He was instructed in art by his father, and his earlier efforts were influenced by the works of Hans Burgkmair, who, according to such authorities as Stetten, was

his maternal uncle. The first paintings that can with certainty be attributed to Holbein's hand are two panels of an altarpiece in the above named collection. Various Madonna pictures which bear traces of the influence of the school of Memling, and a votive work in memory of Burgomaster Ulrich Schwartz, were painted in the immediately following years; but the finest of the artist's productions executed in Augsburg was the altarpiece for the monastery of St Catharine (1515–16), now in the Pinakothek, Munich, Renaissance architectural ornamentation of great beauty being skilfully introduced.

About 1516 Holbein was at work in Basel, but he does not appear to have settled there till 1520, when he received the freedom of the city, and became a member of the guild *Zum Himmel*, which his elder brother Ambrosius, also a painter, had joined three years previously. During the interval he was painting in Zurich, and in Lucerne —where he decorated the interior and exterior of the residence of the mayor, Jacob von Hertenstein, with paintings now only known through drawings which were executed before the building was destroyed in 1824. It is possible that he also during this period made a brief visit to Milan; and the influence of the masters of northern Italy, especially of Mantegna and Leonardo da Vinci, can be traced in his subsequent productions. Among the more important works executed at Basel are the powerful portraits of the Burgomaster Jacob Meier and his wife; while the religious subjects of the period include eight scenes of the Passion, painted upon a panel, ranked very highly by Woltmann, though Rumohr and Wornum are unable to regard them as Holbein's work, and the doors of the organ of Basel Cathedral, painted, upon canvas, with stately figures of saints and bishops. All these works are now in the Basel Museum. To 1522 is due one of the most important of the master's religious pictures, the Madonna and Child with St Ursus and St Martin of Tours (or perhaps St Nicholas), painted for the church of Reuchen, near Solothurn; and to about the same date is assigned the great work commissioned by that Jacob Meier whom Holbein had already painted, and representing the merchant with his wife and family kneeling before the Virgin and Child. The picture exists in two slightly-varying versions at Darmstadt and at Dresden, of which the former is the finer, and is now generally admitted to be the original. His mural decorations of 'The Peasants' Dance' and various classical subjects on the façades of a house in the Eisengasse, and those in the town-hall, are now known only through sketches and a few surviving fragments. He also executed noble portraits of Bonifacius Amerbach, professor at Basel, in the museum there; of Frobenius, the printer; and two distinct portraits of Erasmus and one of Melanchthon. Another interesting memorial of the intercourse between Erasmus and Holbein is a copy of the 'Praise of Folly,' published by Frobenius in 1514, in which the margins are enriched by a series of vigorous and humorous pen-sketches by Holbein. It is now in the Basel Museum.

During his residence at Basel Holbein was largely employed upon designs for the wood-engravers, probably indeed it was mainly with a view to such work that he settled there. In addition to about twenty alphabets of richly ornamental letters, he designed over 300 woodcuts, including printers' devices, title-borders, and such general illustrations as those to Adam Petri's editions of Luther's New Testament (1522 and 1523), to Thomas Wolff's issue of the same work (1523), and to Petri's edition of Luther's Old Testament (1523); as also the large single woodcuts of 'Christ bearing the Cross' and 'The Resurrection,' and the two scarce subjects of 'The Sale of Indulgences' and 'The True Light,' which, like some other of his works, show the artist's warm sympathy with the Reformation. His most important woodcuts, however—the noble series of 'The Dance of Death' and the 'Old Testament Cuts'—though probably executed at this time, were not issued till a later period, the first editions of both being published at Lyons in 1538. It was formerly believed that Holbein was engraver as well as designer of the woodcuts associated with his name, but it is now generally conceded that he only designed and drew them.

In the end of 1526 or the beginning of 1527 Holbein visited England, when he was introduced by Erasmus to Sir Thomas More, then in high favour with Henry VIII. He now began his great series of portraits of the most eminent Englishmen of his time, the studies for many of which exist in the cabinet of eighty-seven masterly drawings by his hand in the royal collection at Windsor. In various ways these drawings throw valuable light upon his methods of work; the fact, for instance, that many of them bear written notes of the colours of their details proves that he was accustomed to execute his finished oil portraits from such charcoal and chalk sketches as these, and not directly from the life. Excellent autotype reproductions of these drawings have been issued by the South Kensington Department. Among the most notable of his oil portraits executed in England are 'Archbishop Warham,' of which versions exist at Lambeth Palace, in the Louvre, and in the possession of Viscount Dillon; 'Sir Henry Guildford,' in the royal collection at Windsor; 'Nicholas Kratzer,' the king's astronomer, in the Louvre; and 'The Family of Sir Thomas More,' now lost, but known through various copies and through the original sketch, now in the Basel Museum.

On his return to Basel (1529) Holbein painted the group of his wife and two children now in the museum there; and in the following year again took up his work in the council-hall, executing powerful mural subjects of 'Rehoboam,' 'Samuel and Saul,' and 'Hezekiah,' works now destroyed. Probably in the beginning of 1532 he again visited London, whence a pressing invitation from the Basel council was ineffectual to withdraw him. At first he was much employed in London by the German merchants of the Hanseatic League, many of whose portraits he executed. Sketches still remain for the decorations which he designed for these traders of the steelyard on the occasion of the marriage of the king to Anne Boleyn; which, with 'The Triumphs of Riches and of Poverty,' were almost the only symbolical subjects executed at this period, to which are also due the great portrait group at Longford Castle known as 'The Ambassadors,' probably representing Sir Thomas Wyatt and John Leyland, the portraits of Thomas Cromwell, and the exquisite circular miniatures of Henry and Charles Brandon, sons of the Duke of Suffolk, in the royal collection at Windsor. He also executed many masterly designs for metal-work, and such drawings for the wood-engravers as the title-pages of Coverdale's translation of the Bible (1535) and of Hall's Chronicles (1548). From a letter from the poet Bourdon to Solimar, dated 1536, we learn that Holbein at that time held the appointment of royal painter to Henry VIII.; and in this capacity he executed at Whitehall Palace a mural painting of the monarch and Queen Jane Seymour, with Henry VII. and Elizabeth of York, destroyed in the fire of 1698, of which a copy by Van Leemput exists at Hampton Court, while a portion of the original cartoon is at Hardwick Hall. This latter work and the large-sized miniature in the possession

of Earl Spencer are regarded by Woltmann as the only surviving authentic portraits of the king from Holbein's hand among the many bearing his name. His delicate and exquisite portrait of Queen Jane Seymour is in the Belvedere, Vienna. To the same period is to be assigned the admirable half length of Sir Nicholas Carew, Master of the King's Horse, at Dalkeith Palace, and the noble portrait of Hubert Morett, the jeweller, formerly attributed to Leonardo, in the Dresden Gallery.

Holbein was repeatedly employed abroad on the king's service. In 1538 he was despatched to the court of the Netherlands to paint a likeness of Christina of Denmark, who had been proposed as a successor to Jane Seymour as queen to Henry VIII. In a three-hours' sitting he executed a sketch 'very perfight;' and from this he produced the noble full-length in the possession of the Duke of Norfolk. This work is one of the painter's choicest masterpieces, most attractive in the quietude of its execution and in its rendering of feminine sweetness and innocence. In the same year he appears to have been in Burgundy upon the king's business; and in July 1539 he was despatched to the court of Cleves, where he painted Anne of Cleves—'expressed her imaige verye lyvelye'—in a work now in the Louvre; while about 1540 he executed the striking portrait of the Duke of Norfolk, uncle of Queen Catharine Howard, of which the original is at Windsor, and an old copy is preserved at Arundel Castle. The last work upon which Holbein was engaged was the picture of 'Henry VIII. granting a Charter to the Masters of the Barber-Surgeons Company,' still preserved in their guildhall. It was left incomplete at the time of his death by the plague, which, as the discovery of his will by Mr Black in 1861 has proved, occurred in London between 7th October and 29th November 1543, eleven years earlier than was previously believed.

Holbein is seen at his highest in his portraiture; and in this department his expressional power, his veracity and dignity, and his noble technical qualities of unerring draughtmanship, subtle and perfect modelling, and richness and force of colouring entitle him to rank with the greatest masters. It is his power as a portraitist that gives value and impressiveness to his religious subjects. He has little of the imaginative force, the visionary power, which stamps the works of an artist like Dürer; but his foot treads very firmly upon the earth, and the faces and forms which he bestows upon his sacred personages are full of homely truth, and a simple, moving pathos. As an ornamentalist he ranks as the equal of the greatest Italian masters, his work of this class being distinguished by easy seizure of form, great nobility of design, and the most exuberant richness of fancy.

Many works by Holbein were included in the South Kensington Portrait Exhibition of 1866, in the Royal Academy Old Masters' Exhibition of 1880, and in the Tudor Exhibition of 1890; but in all of these exhibitions many portraits were quite erroneously attributed to his brush.

See *Hans Holbein und seine Zeit*, das Kunstlers Familie, Leben und Schaffen, by Alfred Woltmann (2d ed. Leip. 1874–76; English trans. of the first edition, by F. E. Bennett, Lond. 1872); and *Some Account of the Life and Works of Hans Holbein*, by R. N. Wornum (Lond. 1867).

Holberg, Ludwig, Baron Holberg, the creator of modern Danish literature, was born at Bergen in Norway, 3d December 1684. He took his degree at Copenhagen, and spent some fourteen years partly as private tutor and partly in travel, in the course of which he visited England (where he studied two years at Oxford), France, Italy, and Germany. In 1718 he was appointed professor of Metaphysics at Copenhagen, but in 1720 exchanged that chair for the more lucrative one of Eloquence. The works that laid the foundation of his fame were satirical poems—first and foremost the serio-comic epic, written in iambics, of *Peder Paars* (1719–20), in which he ridicules the pedantic stiffness and stupidity of contemporary life and thought, and after this *Hans Mikkelsen's Jesting Poems* (1722) and *Hans Mikkelsen's Metamorphoses* (1726). But in 1721 the first Danish theatre was opened at Copenhagen, and Holberg tried his hand at comedy-writing, with, as it turned out, marvellous success. His excellent light comedies, on account of their genuine wit, comic humour, and skilful character-drawing, are counted by the Danes amongst the best things in all their literature. They were published by their author in a collected form in 1723–25, and again, with five new plays added, in 1731–54. In 1730 Holberg became professor of History, and seven years later quæstor of the university; and in 1747 he was ennobled. He died at Copenhagen on 28th January 1754. Perhaps the most noticeable feature in Holberg's character is the versatility of his genius. After 1724 he again turned his pen to history, and wrote, amongst other books, a *History of Denmark*, a *General Church History*, a *History of the Jews*, and *Comparative Biographies of Great Men and Women*, all greatly esteemed, particularly the first. Then in 1741 he produced another classic of Danish literature, the satirico-humoristic romance *Niels Klim's Subterranean Journey*; and lastly he wrote serious reflective works, *Moral Thoughts* (1744) and *Epistles* (1748–54). His *Autobiography* (1727–43) should also be mentioned. *Peder Paars*, the *Subterranean Journey*, and the *Autobiography* have been translated into English.

The best critical edition of his *Comedies* is that published by the Holberg Society in 8 vols. 1848–53 (new ed. 1884). See the monographs by Rahbek (1815–17), Werlauff (1838), Pontz (1857), and G. Brandes (*Holberg and seine Zeitgenossen*, Berlin, 1885).

Holcroft, Thomas, playwright and novelist, was born in London, 10th December 1745 (o.s.). His father, in whom fondness alternated with fury, was by turns a shoemaker, horse-dealer, and pedlar; and he himself, after three years as a Newmarket stable-boy, then eight as shoemaker, schoolmaster, and servant-secretary to Granville Sharpe, in 1770 turned strolling player. He never was much of an actor, best in low comedy and old men's parts; and, after settling in London (1777), he gradually took to authorship. *Alwyn, or the Gentleman Comedian* (1780), was the first of four novels; *Duplicity* (1781), of upwards of thirty plays. Of the latter, *The Follies of a Day* (1784), adapted from Beaumarchais' *Mariage de Figaro*, brought him more than £600; and *The Road to Ruin* (1792), £1300. Between these befell the great sorrow of his life, the death of his eldest son, William (1773–89), who having robbed his father of £40, and been found by him on an American-bound vessel, shot himself: for a twelvemonth the stern, strong man hardly quitted the house. An ardent if peaceable democrat, in 1794 he was tried for high-treason with Hardy, Horne Tooke, and nine others. The proceedings fell through, but the animosity of party spirit entailed a run of ill-luck at the theatres, which, combined with unfortunate speculations, led Holcroft to sell off his books and effects (1799), and to retire for four years to Hamburg and Paris. He died 23d March 1809. See the interesting *Memoirs*, written by himself, and continued by Hazlitt (1815); also Kegan Paul's *William Godwin* (1876).

Holden, Sir Isaac, one of the inventors of lucifer matches and of important modifications in wool-carding machinery, was born 7th May 1807, at

Hurlet, Renfrewshire, his father having been a Cumberland farmer and lead-miner. While a worker in a cotton-mill in Paisley, he fitted himself for the post of an assistant teacher, first at Leeds, then at Huddersfield, and latterly at Reading. Finding flint and steel inconvenient when he got up at 4 A.M. to pursue his studies, he hit on the idea of putting sulphur under explosive material, which solved the problem of the lucifer match. The principle he expounded to his pupils at Reading in 1829, and through them it seems to have become known in London. Holden was not himself aware that lucifer matches had been made nearly two years before by John Walker, a chemist of Stockton-on-Tees, who sold them in April 1827 at one shilling and twopence a box. While book keeper in a worsted-mill at Bingley, Yorkshire (1830–46), Holden became possessed with the ambition of inventing wool-combing machinery. In 1846 he joined with Mr Lister, who had done much to improve the system of wool-combing, in starting a mill at St Denis, near Paris. The rude wool-combing by steel teeth was done away with by Holden's square motion machine in 1850. Lister retired, and the firm became Isaac Holden & Sons in 1859, and the Alston works near Bradford were founded. After the expenditure of about £50,000 in experiments, Holden's wool-combing machinery brought him both fame and fortune. Holden was member for Knaresborough 1865–68, for the North-west Riding 1882–85, and for the Keighley division of Yorkshire from 1885. He was made a baronet in 1893, and preserved his vigorous health till shortly before his death on 13th August 1897.

Holderness, the name of a parliamentary division (including Beverley) and of a wapentake in the East Riding of Yorkshire. Pop. of the former, 41,298; of the latter, 25,000.

Holding, the term in Scots law used to denote the manner in which heritable estate is holden, and corresponding to Tenure (q.v.) in English law. See also FEU, and AGRICULTURAL HOLDINGS ACT.

Holibut. See HALIBUT.

Holiday, in Law, means Sunday, Christmas-day, Good Friday, and any other day appointed for a public festival or fast. In Catholic times holidays were numerous; but modern legislation and custom have considerably reduced their number. Of late years the importance of holidays to working people has been recognised, and acts have been passed increasing the number of bank holidays. When a bill of exchange falls due on a Sunday, payment must be made the day previous. If it falls due on any of the bank holidays, the bill is payable the day after. In England the courts excuse a man for not giving notice of dishonour of bills of exchange not only on Sunday, Good Friday, and Christmas-day, but also even on the festival days of his own religion; and, though there has been no decision in Scotland on the subject, the same rule would no doubt be applied to fast-days prescribed by different sects, and a notice sent on the day following would suffice. But as a general rule, and in all other respects, it may be laid down that no sect, established or unestablished, nor any court or public body, has any power whatever to declare a holiday which has any legal effect, or which can bind the public or the rights of third parties. Nothing but an act of parliament has that effect, and not even a proclamation of the crown would be sufficient. Hence it is that when a solemn national fast is proclaimed, which is to be put on the same footing as a Sunday, it requires a special act of parliament to make it binding on the public in matters of business. See BANK HOLIDAYS; and for ecclesiastical and popular holidays, see FESTIVALS.

Holinshed, RAPHAEL, an English chronicler, belonged to a good Cheshire family, and, according to Wood, was educated at one of the universities, and became a minister of God's word. He appears also to have been steward to Thomas Burdet of Bromcote, in Warwickshire, and died between 1580 and 1584. The work with which his name is connected is *The Chronicles of England, Scotland, and Ireland*, published in two folio volumes in 1577. This edition, together with its predecessor, the Chronicle of Hall, was the direct source from which Shakespeare drew the materials for his English historical plays. If we except the history of *King John*, which stands by itself, these form a regular historical sequence of English kings from Richard II. to Henry VIII., the reign of Henry VII. alone omitted as unsuitable for dramatic representation. And it is not a little interesting and significant that these cover exactly the same period as Hall's Chronicle—a period full of great action and tragical catastrophes profoundly touched with pathos.

The first edition of Holinshed contained many woodcuts which were omitted in the second edition (3 vols. folio; usually bound in two, 1586–87), as well as a number of passages cancelled by order of the Privy-council as disagreeable to Queen Elizabeth. These castrations were published separately in black letter like the original, by Dr Drake in 1723, and are inserted in their proper places in the splendid edition of the *Chronicle* published in six 4to volumes (1807–8). This last edition has the particular merit of an exceptionally full index.

Holinshed was by no means the only writer of the work which bears his name, and, indeed, its whole history is not a little interesting. Early in the reign of Elizabeth the queen's printer, Reginald Wolfe, a German by birth, planned 'a Universal Cosmographie of the whole world, and therewith also certain particular histories of every known nation,' and for the historical part of the work had engaged Raphael Holinshed among other men. When the gigantic work was nearly completed Wolfe died, after twenty-five years' labour at his scheme. Those who were to bear the cost of printing the whole now took fright at the expense, and resolved to do only so much of it in the meantime as related to England, Scotland, and Ireland. Holinshed having the history of these countries in hand, application was made to Harrison to furnish the descriptions of Britain and England to be prefixed to the whole. Of the three volumes in the second edition, the first is made up of these and Holinshed's own history of England till the Conquest. The second contains the Description of Ireland by Richard Stanihurst, the translator of Virgil's *Æneid* into English hexameters, himself a Catholic and the uncle of Archbishop Ussher; then the history of Ireland to its Conquest, adapted from Giraldus Cambrensis, by John Hooker or Vowell, uncle of the Judicious Hooker; next the history of Ireland to the year 1509 by Holinshed; its continuation to 1547 by Stanihurst; and thence to 1586 by Hooker. The second volume contains further the Description of Scotland by Harrison; the history of Scotland by Holinshed, down to 1571, and by Francis Boteville, or Thin, the Lancaster herald, with the help of others, from 1571 to 1586. This was mainly compiled from Bellenden's translation of Boece, John Major, and the continuation of Boece by John Ferreri. The third volume is made up of the history of England from William the Conqueror down to 1577 by Holinshed, and from 1577 down to 1586 by the famous antiquary Stow, Fr. Thin, Abraham Fleming, and others. In the modern six-volume edition of 1807–8 these are more conveniently arranged; the first four volumes

being devoted to the history of England, the fifth to Scotland, the sixth to Ireland, each having the Description of its proper country prefixed.

Holinshed was an honest and industrious man, and had the advantage of being able to consult the manuscripts of Leland. In the 'Preface to the Reader,' at the beginning of the third volume of the second edition, he says: 'My speech is plain, without any rhetorical show of eloquence, having rather a regard to simple truth than to decking words.' And in his conclusion to the reign of Elizabeth, Abraham Fleming, the contributor of many valuable notes throughout the entire work, describes with modest truthfulness those who had labored together as 'men of commendable diligence, though not of deepest judgment.

Holkar, the name of a powerful Mahratta family, the members of which have at various times been formidable enemies to the British empire in India. The founder of the family was Mulhar Rao Holkar, who was born in the Deccan, 1693, and, having gained by his valour the favour of the Peishwah, obtained from him the western half of Malwa, with Indore for his capital. See INDORE, MAHRATTAS.

Holl, FRANK, R.A., portrait and subject painter, was born in Kentish Town, 4th July 1845, a son of Francis Holl, A.R.A. (1815–84), the well-known engraver. He was educated at University College School, London, and in 1860 entered the schools of the Royal Academy, where he won gold and silver medals, in 1863 a two years' scholarship for the best historical painting by his 'Abraham about to sacrifice Isaac,' and in 1868 the travelling studentship of the Academy by his subject-picture of 'The Lord gave, and the Lord hath taken away.' Four years previously he had begun to exhibit in the Royal Academy with a portrait of himself and a subject picture, 'Turned out of Church.' These were followed by various effective *genre*-subjects dealing almost invariably with pathetic scenes from modern life, such as 'I am the Resurrection and the Life' (1872), 'Want—the Pawnbroker's Shop' (1873), 'Her First-born' (1876), 'Newgate—Committed for Trial' (1878), 'Ordered to the Front' (1880), 'Returned from the Wars' (1881), 'Deserted' (1884). He was elected A.R.A. in 1878, and R.A. in 1884. About 1877 he turned his attention to portraiture, and speedily attained immense popularity in this department, his works being marked by a powerful if rather heavy touch, an effective chiaroscuro, and by much dignity of style, though they possess little sweetness of colour, and are somewhat marred by the recurrence of opaque blackness in the shadows. Among the most important of his portraits may be named 'Sir Henry Rawlinson' (1881), 'Duke of Cambridge' (1883), 'Prince of Wales' (1884), 'Duke of Cleveland' (1886), 'Sir G. O. Trevelyan' (1887), and 'W. E. Gladstone,' 'Sir William Jenner,' and 'Lord Spencer' (1888). His health suffered from his incessant artistic production, and he died 31st July 1888. A collection of over fifty of his works was brought together in the winter exhibition of the Royal Academy, 1889.

Holland, the popular and generally-accepted name of a country which is officially described as 'Netherland,' or 'The Netherlands,' applies to a maritime kingdom lying between 50° 43′ and 53° 36′ N. lat., and 3° 22′ and 7° 16′ E. long. It is bounded on the N. by the North Sea, E. by Prussia, S. by Belgium, W. by the North Sea. Its greatest length from north to south is 195 miles, and its greatest breadth from west to east 110 miles. It contains 12,630 sq. m.—little more than one-tenth of the size of Great Britain and Ireland. Luxemburg was long included, but this grand-duchy had a distinct government as a separate state, and Holland only possessed a dynastic interest in it, which passed away with the death of William III. in 1890 (see LUXEMBURG). The following table gives the population of Holland in 1888, the area of the provinces, and the provincial capitals:

North Brabant	1850	510,249	Bois-le-Duc
[illegible]	1840	[illegible]	Arnhem
South Holland	1840	[illegible]	The Hague
North Holland	1840	[illegible]	Haarlem
Zealand	690	[illegible]	Middelburg
Utrecht	510	[illegible]	Utrecht
[illegible]	510	[illegible]	Leeuwarden
Overyssel	1840	[illegible]	Zwolle
Gelderland	1840	[illegible]	Arnhem
Drenthe	1040	120,108	Assen
Limburg	850	280,161	Maastricht
	12,630	4,511,415	

At that date the population of Luxemburg (213,000) was also under the king of the Netherlands. At the census of 1889 the total population of the Netherlands was 4,511,415; in 1895 it was 4,795,646.

Thus, in spite of increased emigration to America North and South, and Africa, the population shows 379 inhabitants to the square mile. Holland is the most densely peopled country of Europe, after Saxony (605 inhabitants to sq. m.) and Belgium (558). The population is thinnest in the eastern provinces, and densest in North and South Holland, where it averages about 850 per square mile. About three-fifths of the population are Protestants, and two-fifths Roman Catholics, besides 100,000 Jews.

In 1895 there were eight towns with more than 40,000 inhabitants—viz. Amsterdam, the capital, 450,000; Rotterdam, 235,000; The Hague, residence of the royal family and seat of the government, 180,000; Utrecht, 93,000; Groningen, 60,000; Haarlem, 58,000; Arnhem, 53,000; and Leyden, 45,000.

Physical Aspect.—Voltaire's words, '*Canards, canaux*,' aptly describe the leading features of the country—flat, full of water and waterways, swarming with aquatic birds. Like Egypt, Holland, in its greater part, is a delta formed by the alluvium deposited by the great rivers that flow through it into the North Sea. But Holland is not only flat: it is also hollow, and this explains its name—Hollowland. In a large measure the soil lies under the level of the water, salt or otherwise. Along the canals the meadows are 10 or 12 feet, sometimes more, beneath the water-line; by the sea, at high tide, there may be a difference in the level of the soil and of the ocean of quite 25 feet or more. Of course all these lands have to be protected by embankments or dykes, the tops thereof, broad and flat, being used for carriage-roads and foot-paths. The constant battle of the Hollanders against the watery element finds expression in the motto of the province of Zealand: *Luctor et emergo!* They utilised the mighty rivers, the Rhine, Waal, and Maas, that traverse and fertilised their country, at an early date; and they have covered the land with a network of canals that is probably unique in the whole world. Apart from forming convenient boundaries, these canals serve a twofold purpose: they are mostly navigable for small craft, and they help to irrigate the land. Large windmills are posted at the main points to pump out the superfluous water; hence they form a conspicuous feature of Dutch landscapes. Other windmills near the towns and villages frequently work for different purposes, but they are one and all remarkable for their peculiar shape and the enormous size of their sails, one single sail reaching often to 120 feet. The canals also provide, when frozen, an important medium of communication to skaters.

HOLLAND

Vlieland
Texel
Terschelling
Ameland
Schiermonnikoog
FRIESLAND
GRONINGEN
DRENTHE
OVERYSSEL
GELDERLAND
UTRECHT
ZUIDER ZEE
NORTH HOLLAND
SOUTH HOLLAND
AMSTERDAM
THE HAGUE
Rotterdam
Dordrecht
Leyden
Haarlem
Utrecht
Arnhem
Nimeguen
Zutphen
Deventer
Zwolle
Leeuwarden
Groningen
Assen
Coevorden
Winterswyk
Doesburg
Bommel
Breda
Bergen op Zoom
Willemstad
Helvoetsluys
Goree
Briel
Dort
Gorcum
Schoonhoven
Woerden
Amersfoort
Hoorn
Enkhuysen
Medemblik
Alkmaar
Edam
Monnikendam
Purmerend
Naarden
Gooiland
Weesp
Muiden
Harlingen
Sneek
Franeker
Dokkum
Bolsward
Workum
Hindeloopen
Stavoren
Lemmer
Heerenveen
Oldeboorn
Steenwyk
Meppel
Hasselt
Zwolle
Kampen
Elburg
Harderwyk
Amersfoort
Vianen
Gorcum
Dort
Rotterdam
Schiedam
Delft
Leyden
Haarlem
Amsterdam
Utrecht
Arnhem
Nimeguen
Tiel
Bommel
Zaltbommel
Doesburg
Zutphen
Deventer
Winterswyk
Breda
Bergen op Zoom
Willemstad
Helvoetsluys
Goree
Briel
Maestricht
Visé
Liege
Huy
Namur
Dinant
Givet
Charlemont
Philippeville
Marienbourg
Beaumont
Chimay
Binche
Mons
Valenciennes
Condé
Tournay
Oudenarde
Ghent
Termonde
Antwerp
Lillo
Fort Liefkenshoek
Fort Ste Marie
Fort Frederick Henry
Fort Isabella
Fort Philippine
Fort Lillo
Fort Ste Philippe
Fort Perle
Fort Ste Marie
Fort Liefkenshoek

Some of them date back for centuries; the most ancient is certainly the *fossa Drusi* in the east, made in the time of Augustus, and referred to by Tacitus. Many canals, regulated by locks (which were probably known in Holland a hundred years before they were introduced into Italy in the 15th century), connect the parallel rivers, and the Yssel forms a link between the Rhine and the canals and meres of Friesland. The latter are vast and somewhat shallow lakes. Thus it is possible to travel on water through the whole of Holland. The principal canals are the North Holland Canal, from Amsterdam to Den Helder, 51 miles long; the William's Canal, through North Brabant and Limburg, which has a length of 71½ miles; the North Sea Canal, from Amsterdam to Ymuiden, on the German Ocean; and the canal from the Maas, near Rotterdam, to the so-called Hoek van Holland, named the New Waterway, which now enables ocean-steamers to reach Rotterdam at all times. We have already described the most important (see CANAL), and we will only add here that in 1890 it was proposed to do away with the locks on the North Sea Canal, making it a level navigable channel for ocean-steamers from end to end. The cutting and maintaining of canals in Holland is one of the chief functions of the Waterstaat, a public department that is carried on under an independent minister of the crown, and is entirely confined to hydraulic engineering. The reclamation of land by the drainage of lakes, and by pushing back the sea and creating what are styled 'polders,' is likewise a leading feature in the operations of the Waterstaat. These newly-reclaimed polderlands always fetch high prices amongst the agricultural classes, as was the case with the Haarlem Lake (q.v.) polder, which was sold in plots at such prices that the state made an excellent bargain. The draining of Haarlem Lake will be eclipsed, should the scheme of laying dry the Zuider Zee (q.v.), which involves an estimated outlay of £26,000,000, be carried out. This would enrich Holland with a new province of about one and a half million acres.

The maintenance of dykes by the Waterstaat forms another task of vital moment; the safety of the state depends upon their constant strength and resisting power where there are no hills or dunes to offer a natural protection against the encroachments of water. It is a mistake to suppose that the ocean is Holland's most treacherous and formidable foe; the rivers, when swollen by heavy rains or falls of snow, are much more dangerous. As the river beds naturally rise by alluvial deposits, the embankments have to be made higher and higher. In times of peril a special dyke service is organised, and headquarters are kept informed night and day by a body of Waterstaat engineers, who direct their trained workmen to the points that are more immediately threatened. Dykes form a very expensive item in the budgets of Holland. Half a million pounds will not cover the annual cost to the state. Besides, many dykes are almost entirely maintained out of local rates. The most formidable and costly sea-dykes are round the western coast-line of Walcheren Island, and near Den Helder in North Holland. These dykes are veritable ramparts, formed by piles at the base, which support a superstructure of earth and stones. The annual cost of keeping one in repair frequently reaches £8000 to £10,000. Despite the care and precautions of ever vigilant and ingenious men, disasters through inundations form but too familiar a feature in the history of Holland. A series of irruptions of the ocean created the Zuider Zee between 1170 and 1395. As Goldsmith says in his *Traveller*, the Dutchman has 'scooped out an empire' from the ocean, and the old Dutch proverb that God made the sea but the Hollander the land holds true to this very day.

Communications.—The oldest railway of Holland is the line connecting Amsterdam and Rotterdam by way of Leyden, which was commenced in 1837. The principle of state railways was settled in 1860, and extended in 1873 and 1875. The whole country is now covered by a network of railways built out of state funds, and in 1890 there were 1630 miles open for traffic. They are not worked by the government, but by a company, which pays the treasury a certain proportion of the net profits. There are several private railways, but the present tendency is to make them state properties. The country roads, mostly paved with bricks, are broad and excellent, but tolls are still maintained. The old-fashioned way of navigating the canals in *trekschuiten*, or boats drawn by horses, or men and even women, along a towing-path, is tending to disappear. The number of passengers carried by state and private railway lines in 1894 was over 24,300,000. During the year 1894, 130,000,000 letters and 4,385,000 telegrams were forwarded. Postal savings-banks were instituted in 1881; in 1895 the deposits amounted to 32,250,000 guilders.

Climate, Agriculture, Produce, &c.—The climate of Holland is much like the climate of England, especially in its frequent and rapid changes; but, as a rule, the Dutch summer is hotter and the Dutch winter colder. Ague is prevalent in the low-lying regions of the west, and foreigners are particularly liable to suffer from its ravages.

Agriculture in its various branches forms one of the leading pursuits of the Dutch. In 1896 there were 25,555 farm-owners and farm-tenants. Land tenure is similar to that in France, and fee-simple with peasant-proprietorship the rule. Cattle-rearing and dairy-farming have been the Dutch farmer's chief occupations from time immemorial. This explains why arable land in Holland only covers an area of 2,150,000 acres, while meadows cover 2,800,000 acres. The farm-stock in the year 1886 consisted of 272,700 horses, 1,530,800 head of cattle, 802,700 sheep, 1,161,200 goats, and 458,200 pigs. Dutch sheep, very large in size, were formerly exported to England in great numbers, until disease stopped the trade, and the same thing happened with cattle. In 1889 the British Privy-council again authorised the importation of live Dutch cattle and sheep. Dutch farmers have suffered heavily through cattle disease, which was at its worst in 1874; but the government has succeeded in stamping it out entirely. Dutch beef and Dutch milch-cows are much esteemed in England and in America. The United States and South Africa buy many horned cattle in Holland for breeding purposes, also Friesland horses, which are extremely strong, and Holland trotters. Dairy-farming had fallen off very much, especially in Friesland, once famous for its butter, because the Dutch dairy-farmers clung to antiquated methods, and so were outstripped by foreign competitors. Holland, formerly one of the chief markets for dairy produce, has now become the principal producer of butter substitutes. But, taught by disastrous experience and the example of Denmark, the Dutch dairy-farmers are at last introducing the 'factory system' and other improvements. Holland exported in 1895 butter to the value of £1,403,000, and cheese to the value of £1,160,000. The common Dutch cheese comes from Gouda, and the round balls are from Edam in North Holland. The staple agricultural products are wheat, rye, oats, potatoes, beet-root, chicory, flax, and tobacco. The use of modern implements, such as steam-ploughs, &c., is now spreading rapidly, like the application of artificial manures.

The soil of Holland is not uniformly fertile. Large tracts of land, especially in the eastern provinces, are simply heath; and the waste lands of Holland covered an area of more than 1,700,000 acres in 1897. A society has been founded for the afforestation of these tracts. The orchards of Boskoop, producing excellent fruit, like the prolific district of Westland, should be mentioned, as also the famous culture of Dutch bulbs at Haarlem and the surrounding districts.

Minerals. As may be readily believed, minerals are scarce in Holland; but valuable clay for the manufacture of tiles, bricks, and pottery is found everywhere in great abundance, and the making of the famous old Delft ware is now reviving. Coal is worked in Limburg, and also a soft sandstone.

Manufactures, Industries, &c. The chief manufactures are linen, woollen, cotton, and silk fabrics, paper, leather, glass, &c. Leyden, Tilburg, and Veenendaal are famed for woollen blankets, wool-dyed pilot, fine cloths, and friezes; 's Hertogenbosch (Bois-le-Duc) for linens and rich damasks. Calicoes, shirtings, drills, table-cloths, striped dimities, &c. are made at Almelo, Amersfoort, and other leading towns. Excellent imitation Smyrna carpets are manufactured at Deventer, and imitation Scotch and other kinds are made at Delft, &c.; turkey-red yarns, dyed silks, and silk stuffs at Roermond, Utrecht, Haarlem, &c.; leather, glass, firearms at Maastricht and Delft; iron-founding, rolling and hammering of lead and copper, cannon founding are carried on at The Hague, &c. Breweries are numerous (541 in 1887): Middelburg, Bois-le-Duc, Amsterdam, Nimeguen, &c. have important ones, those of Bois-le-Duc and Amsterdam manufacturing large quantities. Waalwijk, Heusden, and surrounding districts manufacture boots and shoes. Gin is distilled at Schiedam, Delft, Rotterdam, and Amsterdam. The distilleries of gin ('Hollands') form an important branch of Dutch industry, over 500 existing at the end of 1897. The liqueur factories are of national importance. Amsterdam once had the largest diamond-cutting trade in the world, 10,000 persons depending on that branch of industry; but latterly, owing to various causes (the dearness of rough stones being one of them), the trade has fallen off. Sugar-refining was carried on by 11 establishments in 1895, and there were then also 30 beetroot sugar factories, 50 salt-works, and nearly 600 breweries. The manufacture of cocoa has assumed enormous proportions in the last few years, and there are large works at Weesp, at Amsterdam, and at Rotterdam. North Brabant is the principal centre of the Dutch margarine trade, exported to England in immense quantities. Something like nine tenths of all the margarine sent to England (value £2,498,500 in 1896) comes from Holland.

Fisheries.—The fisheries of Holland, although no longer so important as at one time, are still noteworthy. At the end of 1895 they gave employment to 17,650 men and boys, on board 5189 vessels. The herring-fishery produce annually between 3,000,000 and 4,000,000 barrels from the North Sea alone, and 300,000 tons of salt herrings may be exported in a single year. Trawling is extensively resorted to. 'Dutch coopering' has been virtually abolished by the international North Sea Conventions (see COOPERAGE). Between 25,000,000 and 35,000,000 oysters are annually taken, and a fourth thereof exported to England. The fisheries of Holland are estimated to yield annually £3,000,000.

Imports, Exports, and Shipping. The Dutch are no longer the 'carriers of Europe,' but their carrying trade is still very considerable. The total imports into Holland and exports thence were, in 1894, £121,750,000 and £95,000,000; and the imports from and exports to the United Kingdom in 1894 were £27,600,400 and £8,787,500 respectively. Holland of all European countries does the largest amount of foreign trade per head of population; in 1888, £37, 7s. 1½d. per head (more than thrice that of Great Britain and Ireland). In 1895 the mercantile marine consisted of 425 sailing-vessels of a burden of 110,800 tons, and 157 steamers of 183,000 tons.

Revenue, Expenditure, &c. The revenue of 1890 was estimated at about £10,109,000, and the expenditure at £11,256,000. The East Indies revenue for 1890 was estimated at £10,677,000, the expenditure at £11,700,000. The East India colonies, once a burden, were long a source of profit, but are now a burden again. From 1850 to and with 1874 £25,376,218 was paid off from the national debt. In 1880 the debt amounted to £78,601,216, and the annual interest payable on it was £2,328,000; in 1888 the debt proper was upwards of £88,000,000, besides £1,250,000 in paper money. The annual charge, even after a recent reduction, was still estimated at £2,581,000 for 1890. The great bulk of the national debt is held in Holland; the national prosperity is increasing, and an enormous amount is invested in foreign funds and American railways.

Colonies.—The colonies of Holland are stated to have an area of upwards of 700,000 sq. m. (more than three times the area of the German empire), with a population of about 30,000,000. They fall into two groups: (1) the East Indian possessions, including Java and Madura, Sumatra, the Moluccas, Celebes, Timor, parts of Borneo, and the western part of New Guinea; and (2) the West Indies, of which the chief are Surinam and Curaçao. The factories on the coast of Guinea were disposed of by sale to Great Britain in 1872. The principal colonies are treated at length in separate articles.

Government. The government of Holland is a limited constitutional monarchy. The modern *Grondwet*, or Constitutional Law, of 1848, was altered in 1887 to suit new electoral and other requirements. The crown is the executive power; legislation is vested in the States-general. The king presides at a council of state, whose members are appointed by him. Its functions are similar to those of the Privy-council in Britain. He also selects ministers, who countersign all royal decrees, and whose responsibility is settled by a special law. The States-general is divided into a first and a second chamber. The second chamber consists of one hundred members, the first chamber of fifty members, the former being elected by direct suffrage, the latter by the provincial councils from among the highest-taxed citizens in the state, or those that hold or have held important public posts. The members of the second chamber are elected for four years. Only male subjects thirty years old, in the full possession of their civic rights, are eligible. Each member receives by way of salary £166 a year, and, besides, a stipend for travelling and incidental expenses during each session. The members of the first chamber are elected for a term of nine years. No one can be a member of the two chambers simultaneously. Ministers may sit in both, but only possess a consultative voice. The second chamber alone has the right of amendment and of initiating legislation. All judges are appointed by the crown for life. There is a supreme tribunal (at The Hague), and ministers, members of the States-general, and certain high officials can be arraigned only before it. There is no state religion, but the state supports financially the different churches.

Education.—Primary instruction is provided by the state in all places where it is required. Private

schools are freely permitted, but subject to inspection; and teachers must qualify for their task under a government examination. There are ancient universities at Leyden, Utrecht, and Groningen, and since 1877 a new university at Amsterdam, supported by the municipality. The four universities have upwards of 3000 students. There are Latin schools in the leading municipalities. There are also the Royal Military and Naval Academy at Breda, and that for engineers and the Indian civil service at Delft, besides seminaries in several places for the training of the Roman Catholic clergy, &c. The state pays 30 per cent. of the expenditure on the public schools, and the communes or parishes 70 per cent. In 1895 there were over 3000 elementary public schools, 1351 elementary private schools, and about 150 secondary schools. The pupils in the public elementary schools number 475,000. About 600,000 children under twelve receive some sort of school education, but 10 per cent. none. There is no compulsory attendance in Holland, and many can neither read nor write (5 per cent. of illiterate recruits).

Army, Navy, &c.—The strength of the regular army in Europe is about 62,000 men, and of the colonial army about 40,000 men, some 15,000 thereof being Europeans. Dutch troops are not allowed to be sent to India. The Dutch home army is composed of volunteers, and of a varying proportion of men drawn by lot for five years' service. There is also a local force, called *Schutterij*, drawn by lot from those between twenty-five and thirty-four years of age, to assist in keeping order in peace, and in case of war to act as a mobile corps, and do garrison duty. North and South Holland can be inundated at short notice.

The royal navy on 1st January 1897 consisted of 120 men-of-war, 24 being ironclads. Six are large cruisers, each of 3400 tons, built of iron and steel. There are also numerous torpedo boats for the defence of the coasts and river-mouths.

History.—About a century and a half before our era, a Teutonic people, known to the Romans as the Batavi, and who came from Hesse, occupied the land between the Rhine and the Waal. At this time the Frisians occupied the country north of the Rhine to the Elbe. The Batavi and Frisians differed little in appearance, manner of life, and religion. They clothed themselves with skins, fished, hunted, and led a pastoral life; were faithful, frank, chaste, and hospitable. The songs of the bards composed their literature and history. Warlike and brave, they selected their leader for his courage and prowess, and were armed with a bow and a short spear. They worshipped the sun and moon, and held their meetings in consecrated woods.

The Romans having subdued the Belgæ, next attacked the Frisians, who agreed to pay a tribute of ox-hides and horns, but continued restless and rebellious. The Batavi became allies of Rome, paying no tribute, but supplying a volunteer contingent, chiefly of cavalry, which was renowned for its impetuous bravery, and helped to win the battle of Pharsalia for Cæsar. About 70 A.D. Claudius Civilis, a Batavian, made a bold effort to overthrow the Roman power in Rhenish or Germanic Gaul, but failed in the end. Roman supremacy endured until the 4th century, when the inroads of the Salic Franks were followed by the Saxons and other tribes. The Franks took possession of the *Insula Batavorum*, and the name of the Batavi vanished. Christianity spread among these tribes, and even the Frisians, who were violently opposed to it, were forcibly converted by Charles Martel. At the end of the 8th century all the Low Countries submitted to Charlemagne, who built a palace at Nimeguen, on the Waal. The feudal system now began to develop itself, and dukedoms, counties, lordships, and bishoprics arose, the bishops of Utrecht, the dukes of Guelderland, and the counts of Holland being among the most powerful of these petty rulers, who owned but very little allegiance to their lords. During the 9th and 10th centuries the districts of the modern Netherlands belonged to Lotharingia, which acknowledged alternately French and German sovereignty. The nucleus of the countship of Holland, and the beginning of its power, were the work of Dirk III., who died in 1039. Count William II. was even made King of the Romans (1248) through the influence of Pope Innocent IV. The Crusades weakened the power and resources of the nobles and prelates, so that, during the middle ages, cities began to assume importance, strengthen themselves with walls, and choose their own rulers.

In 1384 the earldom of Flanders passed, through marriage, to the Duke of Burgundy, whose grandson, Philip the Good, made it his special life-effort to form the Netherlands into a powerful kingdom. He bought Namur, inherited Brabant with Limburg, and compelled Jacoba of Bavaria to resign Holland and Zealand. Charles V., as heir to Burgundy, inherited and united the Netherlands under his sceptre. He fostered trades and industries in the Low Countries, and under his rule they attained a great prosperity, whilst cities like Bruges and Ghent reached the zenith of their wealth and power. But he also tyrannised over the land with an iron will and hand, drained the life-blood of the nation for his continual warfare, and depopulated north and south by an implacable Inquisition, which it is computed put to death in various forms at least 100,000 persons for heresy. Yet he was at times popular with the people. He spoke their language. He always remained a Fleming; and Ghent, after attempting to betray him and rising in rebellion against him in 1539, owed her ultimate escape from the destruction which Alva counselled entirely to the fact of the emperor's citizenship. His son Philip II., who succeeded to the throne in October 1555, was a character of the very opposite type. A Spaniard born, he remained a Castilian to his dying day—austere, harsh, narrow, domineering, fanatical. He never spoke a word of Dutch, nor did he understand the people. With Philip II. commenced that terrible and desperate and long-fought struggle of Holland and Spain which finally resulted in the throwing off of the Spanish yoke, in the establishment of a free, strong, and prosperous commonwealth among the marshes of the low-lying delta. This heroic contest of the few against the many, of a handful of isolated burghers against the combined forces of the most powerful state in Europe, has excited a wonderful amount of interest in the civilised world. Motley, with the now countless editions of his great work, *The Rise of the Dutch Republic*, and its continuation, has done more to popularise the story of the so-called Eighty Years' War of the Low Countries against Spain than any of his predecessors.

Philip II. only remained in Holland for four brief years and then left it, never to return, appointing as regent Margaret of Parma, mother of the famous Farnese, and a natural daughter of Charles V., with a council, to which belonged Viglius, Berlaymont, the afterwards notorious Cardinal Granvella, Bishop of Arras—all friends and flatterers of the young king and enemies of the people—as well as Egmont, who had won the battles of St Quentin and Gravelines for Philip, and the king's lieutenant in Holland, Zealand, and Utrecht, young William of Orange, then completely unknown to fame. As the latter took leave of Philip, who was embarking at Flushing to return to Spain, the king bitterly complained to him of the opposition already mani

bested against his measures. These were mainly the maintenance of a standing Spanish army and of the Inquisition—both contrary to the laws and privileges of the people, as well as to his own solemn vows before ascending the throne. Orange tried to persuade the king that he had nothing to do with the resistance complained of, as the Estates were acting on their own responsibility when they had petitioned his majesty. Whereupon Philip seized the Prince of Orange by the wrist, shaking it violently, and exclaiming in Spanish, *No los Estados, no vos, vos, vos!* ('Not the Estates, but you, you, you!'). The king on this memorable occasion showed as much perspicacity as his reign betrayed perverseness and perfidy. In William of Orange, then only twenty-six years old and six years his junior, Philip had truly recognised his worst foe, his most dangerous opponent, and the soul of the coming struggle against the royal authority. The king's secret correspondence is there to confirm this view. Born on 16th April 1533, William belonged to an ancient family ruling a small principality in the south of France (see ORANGE), but his ancestors, originally vassals of the pope, had settled in the Netherlands, where they occupied high functions under the princes of the House of Burgundy. William had been a favourite with Charles, whom he accompanied everywhere. It was thus that William had been able to acquire that profound knowledge of the military art, and to grasp the intricacies of the prevalent occult diplomacy in which he afterwards proved himself such a consummate master. It was while he was hunting with the king of France in the Forest of Vincennes that Henry II. communicated to William of Orange the fiendish plot France and Spain had concocted to massacre all the Protestants in both countries. Henry II. did not know then the man to whom he had been so communicative: he had spoken to William the Silent. The prince never betrayed the least emotion. He buried in his bosom the project of a crime which, although a devout Catholic himself (though a Protestant afterwards), he had resolved to prevent at all hazards. He saw the storm coming. He determined to face it, to devote his fortune, his best powers, and his life to the cause of the weak against the strong, of the free against crushing despotism, fighting Philip with his own weapons, and having but one noble, self-sacrificing ambition—the welfare and the liberty of the people.

There is no doubt that Philip was betrayed by those in whom he had most implicit confidence, and that William of Orange knew of all the king's intentions and movements. Thus he was aware that Alva had collected an army in Italy by the orders of Philip in order to extirpate an abominable rebellion of heretics by sword, and re-establish the Inquisition. The prince warned his friends Egmont and Hoorn in good time against the imminent danger; but they heeded not what he said, and paid for their folly on the scaffold of Brussels as soon as Alva had arrived there with 10,000 picked troops and had established his Council of Troubles. This was no better than a council of butchers, and by means of it 20,000 inoffensive burghers were hurried to their doom. William escaped to Germany in order to organise the national defence with his brothers. But his task was well-nigh hopeless. What could he do with a handful of half-paid and under-fed hirelings? In 1572 the position of affairs could scarce have been more desperate. The Spaniards were absolute masters of the land, and the people, crushed under a reign of bloody rapine, had ceased to hope for deliverance, when the bold capture of Briel, by the Beggars of the Sea, on the 1st of April 1572—a great date in Dutch history, duly honoured in 1872—changed the whole aspect of affairs. They were marauders, those Beggars of the Sea, desperadoes clinging to the broad, hospitable ocean, after having been driven from the land by the Spaniard; but they were also patriots who had adopted as a title of honour the opprobrious epithet that Berlaymont had given them when they were petitioning the regent for the maintenance of their rights, and they held Briel for 'Father William.' Their daring capture became the sign of a general revolt, and soon William the Silent was again at the head of affairs, 'in the name of the king,' still nominally maintained as the ruler of the land. Orange's projects, which consisted of a junction with the French Huguenots, were indeed direfully frustrated by the butchery of St Bartholomew. The southern portion of the Low Countries could not be delivered from the clutches of the enemy and were for ever lost to the cause of freedom; but the north continued the struggle single handed, and at last Alva had to depart in disgust without having accomplished his mission. His successors could do nothing to retrieve Philip's fortunes or damp the inspiriting influence which the heroic defence of towns like Haarlem, Leyden, and Alkmaar had infused into the burghers of the new state. The military chest of the Spanish commanders was always empty, as the Dutch, masters on the sea, cut off all supplies, and revolts were frequent among the Spanish soldiery. Ottavio Farnese, Duke of Parma, who succeeded to the lieutenancy in 1578, saw but one way of settling the question, and that was the forcible removal of William of Orange. Philip, who had held all along the same sinister designs, was only too eager to fall in with this plan. In June 1580 there appeared that infamous ban, which declared William a traitor, a miscreant, and an outlaw, putting a heavy price upon his head (25,000 gold crowns), and promising the king's pardon and titles of nobility to whosoever might be found willing to rid the land of him. William replied in his famous *Apologie*: but he was not able to cope with a royal assassin. Numerous attempts against the prince's life were made, and although they failed for a time, the bravo's work was finally accomplished. Balthasar Gerards, the miserable instrument of a royal murderer, shot William dead with a pistol, purchased with the very money the prince had given him by way of alms to a 'poor Calvinist.' This took place at Delft on 12th July 1584, near the top of a staircase which has been preserved in the same state ever since. Gerards was arrested, tortured, and finally put to death in an atrocious manner; but no expiation, however awful, could bring to life again the noble patriot.

The blow was crushing and irreparable, yet William might have fallen at a moment even more critical to Holland than July 1584. He did not leave his country in a state of paralysed chaos. The Union of Utrecht, accomplished in January 1579, had cemented the alliance of the northern provinces banded together against the king of Spain; and the solemn declaration of July 1581, by which the free Netherlands for ever renounced their allegiance to Philip II., had virtually completed William's task of deliverer. His manifesto of renunciation and denunciation would alone have sufficed to stamp him as a man of genius in the eyes of posterity. It is a remarkably clear, bold, and spirited defence of a people's rights against the claimed rights of the anointed king at a time when the former had been forgotten. Yet William's doom, far from undoing his work, as Philip and Parma hoped, only tended to make it more durable. The bloody deed seemed to spur the whole nation to a revolt fiercer than ever. Maurice of Nassau followed in his father's footsteps, and the successes of the Dutch, especially at sea,

became more numerous. Parma, indeed, took Antwerp after a long siege, but failed to effect a junction with the Armada in 1588, as the Hollanders prevented his fleet from leaving the Scheldt; and when the great general died in 1592, six years before his master, he had not accomplished his mission. Philip III. was not more fortunate, and could do nothing better than sign in 1609 the twelve years' armistice with the 'rebels,' who were already masters of the sea, had laid the foundations of their great Indian empire by the establishment of the East India Company in 1602, and practically had made their own conditions. Maurice had been against the armistice, but he was overruled by the States, who wanted peace for trading. Unfortunately, the breathing time to 1621 was in a large measure filled up with religious and political dissensions between the adherents of Gomarus, the orthodox Lutherans, and the Arminians, the milder-mannered followers of Arminius, to whom Hugo Grotius and other celebrated men of the time belonged. These disputes culminated in the persecution of the Arminians, who were forced to flee, like Grotius, or were put on their trial for high-treason, like Olden Barneveldt, the Grand-pensionary of Holland, and one of her most distinguished sons, who was beheaded in 1618 with the approval of Maurice. But these internal troubles did not check the progress of the new republic. Maurice died in 1625, and his brother Frederick Henry finally freed his country from the Spaniards, who in 1648 were compelled to recognise the 'rebels' as an independent nation by the treaty of Munster.

In this epoch lies, perhaps, the period of Holland's greatest material and intellectual development. Her ships could be seen everywhere, and the Dutch had become the general carriers of the world's trade. Amsterdam, grown powerful and rich, was the Venice of the north, where, besides commerce proper, both banking and stockbroking reached a flourishing stage at an early period. From this emporium started the fleets of the great trading companies, and the vessels of intrepid explorers like Hudson, Heemskerck, Houtman, Lemaire, Tasman, and many others. Dutch agriculture and floriculture, gaining new experience and teaching fresh methods, grew famous, and so did many branches of science and industry. The first optical instruments came from Holland, and Huygens gave us the pendulum-clock. Arts and letters flourished, and the names of Erasmus, Grotius, Vossius, Burman, Gronovius, Boerhaave, Spinoza, Huygens, Rembrandt, Cuyp, Van der Helst, Hobbema, Potter, and many more became known and illustrious far beyond the national frontiers. The art of printing, perhaps not a glory of Holland in its inception (see PRINTING), had at anyrate attained a high degree of perfection there in the 17th century, as the names of Plantin and Elzevir testify. The liberty of the press, secured at an early date, led to the establishment of numerous newspapers, Dutch and foreign. The foreign news-sheets of Holland, mostly published in French, were sent all over the world, as they contained the latest intelligence and things that were not allowed to appear in print elsewhere. The *Gazette de Leyde* was among the oldest and most powerful of these early journals (1680–1814).

The rising power of Holland had the natural result of creating envy and cupidity in her nearest neighbours. The first serious antagonism came from England, where trade and navigation were also rapidly coming to the front. Both countries were then pure commonwealths—Cromwell ruling in England, and the Grand pensionary John de Witt having virtually the destinies of the United Provinces in his hands since the death of Frederick Henry's son, the last stadtholder before William III. Cromwell's Act of Navigation, which aimed at the destruction of Holland's monopoly in the carrying trade, led to the great naval war of 1652–54, during which twelve important battles, more or less decisive, were fought, and both nations distinguished themselves by the intrepid daring of their commanders and seamanship. Yet otherwise the result was barren, though the names of De Ruyter, Tromp, Evertsen, and Van Galen shone forth ever afterwards. These hostilities between Holland and England were renewed when Charles II. had been restored by General Monk; but the war of 1664–67 remained as undecisive as its predecessor, despite De Ruyter's daring feat of sailing up the Medway, which caused for a while wild panic in the British capital.

An ensuing war with France, now allied with England against the United Provinces, was much more serious, as De Witt had done his best to strengthen the navy, but at the cost of a totally neglected army. The hosts of Louis XIV., under captains so famous as Condé and Turenne, made short work of all resistance that Holland could offer on land, although De Ruyter's fleet kept the allied squadrons at bay, and thus, probably, saved his country from political annihilation. At the most critical juncture a violent popular reaction set in against De Witt and his brother Cornelis, and in favour of the young Prince of Orange, who had been held back by their party. John de Witt, one of the most clear-headed and bold statesmen of his day, was murdered as a traitor by an infuriated mob at The Hague, and the stadtholdership re-established in the person of a prince then (1672) only twenty-two years of age. But the people's instinct had been right after all, for William III.'s accession proved the salvation of Holland, as it also accomplished, later on, the political regeneration of England. The fortunes of the war changed immediately with William at the head of affairs. He showed himself an able tactician and a still more skilful diplomatist. By dexterously manœuvring between Holland's enemies he managed to gain time and isolate France. At last, in 1678, Louis XIV. was compelled to sign the treaty of peace of Nimeguen, as William had become, for the time being, the ally of the king of England, by his marriage with Mary, daughter of the Duke of York. William was not satisfied with what the peace of Nimeguen gave to Holland; and the following years were passed in preparing for the great events which he no doubt saw rapidly approaching. The revocation of the Edict of Nantes flooded Holland once more with political refugees, who here found a new fatherland, and who subsequently helped to fight the battles of Europe against their common tyrant. In the English Revolution of 1688 by William III., many of these Huguenots played an active and prominent part. To Holland the inauguration of the new era in England did not mean peace, but it meant an honourable alliance and security from further encroachments of the French king. The Dutch troops fought bravely in the battles of England, even after William's death in 1702; and Ramillies, Oudenarde, and Malplaquet, which saw Louis's greatest humiliation, were as much Dutch victories as La Hogue was an English victory.

The peace of Utrecht, in 1713, marks the close of Holland's activity as a great power in Europe. For her the 18th century was the century of demoralisation and decay. After William's death she became a republic once more; the stadtholdership was re-established in 1747, but it made no difference in the downward course. The National Convention of France having declared war against Great Britain and the stadtholder of Holland in 1793, French armies overran Belgium (1794); they

were welcomed by the so-called patriots of the United Provinces, and William V. and his family (January 1795) were obliged to escape from Scheveningen to England in a fishing smack, and the French rule began. The United Provinces now became the Batavian Republic, paying eight and a half millions sterling for a French army of 25,000 men, besides giving up important parts of the country along the Belgian frontier. After several changes Louis Bonaparte, 5th June 1806, was appointed king of Holland, but, four years later, was obliged to resign because he refused to be a mere tool in the hands of the French emperor. Holland was then added to the empire, and formed into seven departments. The fall of Napoleon I. and the dismemberment of the French empire led to the recall of the Orange family and the formation of the southern and northern provinces into the ill-managed kingdom of the Netherlands, which in 1830 was broken up by the secession of Belgium (q.v.). In 1839 peace was finally concluded with Belgium; but almost immediately after national discontent with the government showed itself, and William I. in 1840 abdicated in favour of his son. Holland being moved by the revolutionary fever of 1848, King William II. granted a new constitution, according to which new chambers were chosen, but they had scarcely met when he died, March 1849, and William III. (born 1817) ascended the throne.

The bill for the emancipation of the slaves in the Dutch West Indian possessions, passed in 1862, decreed a compensation for each slave, and came into force in 1863. The expenses of this emancipation came to £1,065,366, and the number of slaves set free was about 42,000, of whom 35,000 were in Dutch Guiana.

In 1863 the naval powers bought up the right of the king of Holland to levy toll on vessels navigating the river Scheldt (q.v.), the king of Belgium binding himself also to reduce the harbour, pilot, and other charges on shipping within that kingdom. In 1868 the Luxemburg (q.v.) question was settled in a manner satisfactory to Holland. Next year capital punishment was abolished. In 1872 a new treaty with England, defining and limiting the sphere of influence and action of Britain and Holland in the Indian Archipelago, and removing the restrictions of the treaty of 1824 as to Sumatra, was followed by a war with Atcheen, until then an independent Malay state in North Sumatra (see ACHEEN), a war that severely taxed the military and financial resources of the Dutch-Indian government, and is still carried on, in a modified form, the so-called conquest of 1873–75 notwithstanding. William III. having no living male issue, the succession to the crown was vested in the Princess of Orange, Wilhelmina, the only child of the king's second marriage, born in 1880. For many years the great question of internal politics was the new constitution, which, promulgated November 30, 1887, increased the electorate of Holland by no less than 200,000 voters. A revision of the school-laws in a sectarian sense was carried in 1889. In 1888 the queen, Emma of Waldeck, had been appointed regent in the event of the king's demise; and on the death of the king (23d November 1890), when Luxemburg ceased to be connected with the crown of Holland, the Princess Wilhelmina became queen.

Language and Literature. Dutch is an essential link in the chain of Teutonic languages, a wonderful storehouse of old and expressive Germanic words and phrases. It has been said that Old English is Dutch, and to no other nation is the study of the Netherlandish more interesting than to the English. Without a knowledge of Dutch it is almost impossible to properly understand the historical development of English. It is a common mistake to suppose that Dutch is merely a German dialect. As a language it has existed as long as German, and passed through the same series of evolutions. It possesses many affinities with German, because, like Frisian, Danish, &c., it sprang from the common Teutonic stock (see DUTCH; and for the relation of Dutch and Low German to High German, see GERMANY, Vol. V. p. 186); but between modern High German and modern Dutch there is less similarity in vocabulary than between modern English and modern Netherlandish, although the pronunciation differs much more in the latter case. Three great periods of development must be distinguished in the Netherlandish language, as in the German; the first was the period of inception, or of Old Netherlandish, when doubtless various Teutonic dialects existed among the tribes and peoples that had penetrated westward from the Elbe and the Oder. A curious relic of this ancient Netherlandish exists in a fragmentary translation of the Psalms, dating from the 9th century. It does not seem to belong to any one language, but looks like an attempt at combining the dialects then existing. The second period comprises the Middle Netherlandish, which developed soon after the 11th century, and became the popular tongue of a very considerable area, spreading far beyond the Rhine in the east, and covering not only the greater part of Belgium, as it now exists, but also the northern portions of France, where Old Dutch persists to this very day in the villages, with the wondrous tenacity of popular tongues. The second period is rich in *fabliaux* and romances of chivalry, but these were nearly all of foreign origin, mostly French and some English. Among them we name *Ferquut*, *Roman van Lancelot*, *Walewein*, *Floris en Blancefloer*, all republished of late, but not easily understood without a dictionary of Middle Netherlandish. *Reinaert* (see REYNARD THE FOX) is a truly national epic of considerable importance. But the most prominent representatives of Middle Netherlandish literature are Jakob van Maerlant (13th century) and Jan Boendale (14th century). The former was the author of the famous *Spieghel Historiael*; the latter wrote didactic poems, the best known of which is *Der Leken Spieghel*. To this period also belong Jan van Heelu's description of the battle of Woeringen and Melis Stoke's chronicles of Holland.

The origin of new Netherlandish or Dutch is to be found with the *Rederijkers*, whose rise can be traced to the commencement of the 15th century. They were mainly lovers of letters and the theatrical art, banded together in *Kamers*, 'chambers,' or clubs, for the purpose of study and mental recreation. In the course of time, when the troubles with Spain arose, these clubs no doubt also became centres of political agitation, and this led to their suppression in the southern provinces; but in the north, as soon as political freedom had been attained, they developed into literary associations of considerable importance. The most famous was the 'chamber' called *In Liefde Bloeijende* ('thriving in love') at Amsterdam, to which Coornhert (1522–90), Spiegel (1549–1612), and Roemer Visscher (1547–1620) belonged, the latter a literary merchant, and the father of two ladies who became celebrated for their learning amongst the men of letters of that period. Coornhert, Spiegel, and Visscher in 1584 caused a Dutch grammar to be published, and this may be called the foundation-stone of modern Netherlandish. Hooft (1581–1647) was the first to recognise the worth of his mother-tongue and to write a classical Dutch in which he strove to eliminate as much as possible all foreign elements, although a great admirer of classical lore and foreign literature, especially

French and Italian. At Muiden he formed a literary club which exercised very great influence. Hooft wrote his *Historiën*, but he also excelled in poetry and in the drama. Among his famous contemporaries is Vondel (1587–1679), who is considered the greatest of Holland's poets, and who, indeed, soars high in his dramas, still performed before appreciative audiences in our days. Milton, it is said, borrowed from Vondel, and passages taken from the masterpieces of the two poets certainly bear a curious resemblance. Vondel, some of whose dramatic works have been translated into German and English, was a very prolific poet. Yet his poetry can hardly be called so popular as that of Jacob Cats (1577–1660), whose maxims were for a long time, with the Bible, the only book found in every cottage. Cats is witty, but coarse; and Bredero, whose comedies deserve mention, is scarcely better in this respect. Van der Goes, who composed a beautiful poem on Amsterdam, ranks among the best of Vondel's disciples (1647–84); Oudaen (1628–92) is noted for his political poems and his dramas; Constantyn Huyghens, the father of the great mathematician, for his epigrams and his didactic poetry (the *Korenbloemen*, 'cornflowers,' is still read and admired); and Brandt, for his historical writings.

This is the great period of literary activity in Holland previous to the revival which marked the end of the 18th century. Writers who were desirous of being read beyond the limits of their vernacular had to use Latin; and Erasmus, Boerhaave, Grotius, Spinoza, to mention only a few of the most famous, would scarcely have been so well known had they written exclusively in the language of Vondel.

The 18th century is the period also of literary decadence in Holland; the only great names are those of Feith and Bilderdijk (1756–1831). The latter wrote poetry such as has not been equalled since in the Dutch language, and it is a national loss that his great epic poem, *The Destruction of the First World*, remained unfinished. Bilderdijk also ranks high as a historian, and his philological studies deserve credit, though his learning was sometimes misled by his ingenuity. Among Bilderdijk's contemporaries are Helmers, whose patriotic songs against the French created in Holland as profound a sensation as Körner's in Germany, and the two literary ladies, Deken and Bekker, whose novels (one of them translated into German), written in conjunction, are true pictures of Dutch life in those days. The poems of Tollens (1780–1856) came later, and still retain their hold on the popular fancy (especially in the words of the national hymn) notwithstanding the appearance of numerous still more modern competitors, among whom we can only mention here Van Beers, Beets, Da Costa, Schimmel, Hofdijk, and J. Van Lennep. Schimmel is also noted for his dramas and historical romances, the plots whereof he loves to place in England, when not in Holland. Beets has been truly called the Charles Dickens of the Dutch, as his inimitable *Camera Obscura* (sketches of Dutch life) proves. These two authors are not unknown in England and America, as portions of their work have been translated. So have some of the stirring novels of Van Lennep. Hofdijk, who died in 1888, is known for his faithful and eloquent historical writings not less than for his lyrical poetry. Potgieter, Ter Haar, Heye, Ten Kate, and many others have each excelled in a particular branch of poetry. Among noteworthy novelists we must mention Hendrik Conscience, 'Miss Wallis' (a daughter of Dr Opzoomer), and Mrs Bosboom Toussaint; and we cannot conclude without paying a tribute to the undoubted gifts of 'Multatuli' (Douwes Dekker), whose *Max Havelaar* has been translated into nearly every European language. 'Maarten Maartens' writes powerful novels in English; and Maeterlinck has been called 'the Flemish Shakespeare.' In law and theology the names of Opzoomer, Kuenen, and Kern are almost as well known without as within the kingdom.

In this necessarily rapid sketch we have made no distinction between Dutch writers in Belgium and Dutch writers in Holland. In fact, there is no distinction; they express their thoughts in the same language. The words 'Flemish' and 'Flemlander' have been invented by the French, and only serve to obscure what is a fact—viz. that there never has been a greater difference between the Dutch as taught at Antwerp and the Dutch as taught in Amsterdam than between Boston, Edinburgh, or Manchester English. There have been slight varieties in the spelling; but these have disappeared since the orthography of 1864 has been adopted in both the north and the south, and modern Netherlandish is now the language of some 7,000,000 Netherlanders, of whom 2,500,000 politically belong to Belgium. This is perfectly well understood in the two countries themselves, where Dutch philological and literary congresses are annually held in a northern and a southern centre by turns. In Belgium there are more Dutch than Walloons, and the Belgian constitution does not recognise a preponderating French language. No doubt the Dutch Belgians have only latterly insisted upon the maintenance of their rights in this respect; but ever since the so-called 'Flemish movement' commenced they have steadily gained ground, and all the French encroachments are being swept away. Dutch is being taught everywhere in the schools, and a knowledge of Dutch is essential in many functions, even in those of the king, who was taught Netherlandish by the great novelist Hendrik Conscience. The latter was one of the prime movers in the Dutch reaction in Belgium, wherewith the names of Willems, Blommaert, Snellaert, Snieders, Hiel, Van Beers, &c. will for ever remain associated—some as fiery poets, some as noted prose-writers.

For statistics, consult the annual *Staatsalmanak*, which possesses a semi-official character; the publications of the Dutch Statistical Society, Amsterdam, particularly *Jaarcijfers*, a statistical annual in French and Dutch, in two parts, one of which deals with the colonies; the *Algemeen Statistiek*, in several volumes, which is an official survey of the kingdom, with full particulars, but now somewhat antiquated in many details; the annual reports of British consuls in the Netherlands; the *Almanach de Gotha*, &c. For general descriptions and travel, see the works of Montegut, Esquiros, and particularly Henri Havard; his volumes in pleasant French (three of which, *The Heart of Holland*, *Picturesque Holland*, and *The Dead Cities of the Zuyder Zee*, exist in English) have much contributed towards propagating sound knowledge of the land and people. D'Amicis' *Olanda* (trans. into English) is also useful. For history, the writings of Prescott, Motley, Thorold Rogers, Wagenaar, the very valuable collections of Gachard and Groen, the histories of Th. Juste, Bilderdijk, Fruin, Arend, Nuijens, Hofdijk, &c. (all in Dutch, except Juste, who wrote in French) should be consulted. The most accessible literary history is Schmeder's *Geschichte der Niederländischen Literatur* (Leip. 1888), which is also the best in every way.

Holland, in contradistinction to the kingdom of that name, is the oldest, wealthiest, and most populated part thereof, forming two provinces, North and South Holland. The province of North Holland has an area of 1070 sq. m., and a population of 906,136 in 1895. It comprises the peninsula to the west of the Zuyder Zee, and also the islands that fringe this great gulf on its northern side. To the west North Holland is bounded by the German Ocean, and to the south by the province

of South Holland. This latter province has an area of 1162 sq. m., lying between the German Ocean and the provinces of Zealand, Utrecht and North Holland. It had a population in 1021,880 in 1895. The population of both North and South Holland is largely agricultural. It is in these provinces that the best corn is grown, the best cattle reared, and the best dairy produce brought to market. But as the largest towns of the kingdom (Amsterdam and Rotterdam) are also situated in these two provinces, its chief trade and industries, with nearly the whole of its shipping, are carried on in them.

Holland, originally a fine kind of linen manufactured in the Netherlands, and now a coarse linen fabric, unbleached or dyed brown, which is used for covering furniture, &c.

Holland, PARTS OF. See LINCOLNSHIRE.

Holland, LORD. HENRY RICHARD VASSALL FOX, third Baron Holland, F.R.S., was born at Waterslow House, Wilts, in 1773, and succeeded to the title on the death of his father, the second baron, in 1774. He went to Eton, and thence to Christ Church. He was trained for public life by his celebrated uncle, Charles James Fox, after whose death he held the post of Lord Privy Seal in the Grenville ministry for a few months. He then shared the long banishment of the Whigs from the councils of their sovereign. During this long and dreary interval Holland, to use the language of Macaulay, was the 'constant protector of all oppressed races and persecuted sects.' He held unpopular opinions on the war with France; strove zealously to mitigate the severity of the criminal code; made war on the slave-trade; threw his heart into the struggle against the Corn Laws; and, although an aristocrat, laboured to extend the liberties of the subject. In 1830 he became Chancellor of the Duchy of Lancaster and a member of the reform cabinet of Earl Grey, and these posts he also held in the Melbourne ministry. He died at Holland House, Kensington, October 22, 1840. He wrote biographies of Guillen de Castro and Lope de Vega, translated Spanish comedies, prepared a life of his uncle, and edited the memoirs of Lord Waldegrave.—His wife, ELIZABETH VASSALL (1770–1845), daughter of a wealthy Jamaica planter, married in 1786 Sir Godfrey Webster; but the marriage was dissolved in 1797 for her adultery with Lord Holland, who immediately married her. She was distinguished for beauty, conversational gifts, and autocratic ways; and till the end of her life her house was a meeting place for brilliant wits and distinguished statesmen.—Their son, the fourth Lord Holland (1802–59), edited two works by his father, *Foreign Reminiscences* (1850) and *Memoirs of the Whig Party* (1854). See the Princess Marie Lichtenstein's *Holland House* (1873).

Holland, SIR HENRY, physician, was born at Knutsford, Cheshire, on 27th October 1788, and studied at Edinburgh. He wrote a book on his three years' *Travels in Albania, Thessaly*, settled in London in 1816, and soon became one of the recognised heads of his profession. In 1828 he was elected a Fellow of the Royal College of Physicians; in 1840 he was appointed physician in ordinary to the Prince Consort, and in 1852 physician-in-ordinary to the Queen. In the following year he was created a baronet. His *Medical Notes and Reflections*, published in 1839, consist of 34 essays upon various departments of medicine and psychology; it has passed through several editions. In 1852 appeared *Chapters on Mental Physiology*, which are expansions of those essays in his former work which treated of 'that particular part of human physiology which comprises the reciprocal actions and relations of mental and bodily phenomena.' Other books from his pen are *Essays on Scientific Subjects* (1862) and *Recollections of Past Life* (1871). Holland died at London, 27th October 1873. He was related in different degrees to Josiah Wedgwood, Mrs Gaskell, and Charles Darwin, and married for his second wife a daughter of Sydney Smith. See KNUTSFORD.

Holland, HENRY SCOTT, preacher and theologian, was born at Ledbury, in Herefordshire, in 1847, and educated at Eton and Balliol. He took first-class honours in 1870, and, after having been theological tutor at Christchurch and select preacher, he became canon of Truro in 1882 and canon of St Paul's in 1884. He has published some remarkable volumes of sermons, including *Logic and Life* (1882).

Holland, JOSIAH GILBERT, an American author, was born in Belchertown, Massachusetts, 24th July 1819, and graduated at the Berkshire medical college, at Pittsfield, in 1844. He soon abandoned his profession, however, and after fifteen months as a school superintendent at Richmond, Virginia, became assistant editor of the Springfield *Republican*, of which he was part proprietor also from 1851 to 1866. In 1870, with Roswell Smith and the Scribners, he founded *Scribner's Monthly*, which he conducted successfully till his death, 12th October 1881. In this magazine appeared his novels, *Arthur Bonnicastle* (1873), *The Story of Sevenoaks* (1875), and *Nicholas Minturn* (1876). His *Timothy Titcomb's Letters* (1858) went through nine editions in a few months; and this sale was exceeded by his *Life of Lincoln* and his most popular poems, *Bitter Sweet* (1858), *Kathrina* (1867), and *The Mistress of the Manse* (1874). Most of his works have been republished in Britain. See the Life by Mrs Plunkett (1894).

Holland, PHILEMON, styled 'the translator-general of his age,' was born at Chelmsford, in Essex, in 1552. He became a Fellow of Trinity College, Cambridge, and in 1591 took at that university the degree of M.D. He afterwards practised medicine at Coventry, and in 1628 was appointed head-master of the free school there. He died on 9th February 1637. His more notable translations were Livy, Pliny's *Natural History*, Suetonius, Plutarch's *Morals*, Ammianus Marcellinus, Xenophon's *Cyropædia*, and Camden's *Britannia*. His son, Henry Holland, a bookseller in London, published *Heroologia Anglicana* (1620) and *Basilologia* (1618).

Hollands, See GIN.

Hollar, WENCESLAUS (1607–77), etcher. See ENGRAVING, Vol. IV. p. 380.

Holles, DENZIL, LORD, one of the 'five members,' was the son of the Earl of Clare, and was born at Houghton, in Nottinghamshire, in 1599. He entered parliament in 1624, and at once joined the party opposed to the king's government. On March 2, 1629, he was one of the members who held the Speaker in his chair whilst resolutions were passed against Arminianism and tonnage and poundage. For this act he was condemned by the Court of King's Bench to pay a fine of one thousand marks, and to be imprisoned in the Tower during the king's pleasure; he remained there about a twelvemonth. He was one of the members of parliament whom Charles accused of high-treason and attempted to arrest in 1642. On the outbreak of the Civil War he was charged to hold Bristol; but, dreading the supremacy of the army more than he dreaded the pretensions of the king, Holles was a steady advocate of peace. He was a foremost leader of the Presbyterian party. For having in 1647 proposed to disband

the army he was accused of high treason; but, leaving his native land, he found refuge in Normandy. Again, after a brief return visit to England in the following year, he went back to Brittany, and stayed there until Cromwell's death. On his reappearance in England Holles set to work to effect the restoration of the Stuarts; he was the spokesman of the commission delegated to carry the invitation of recall to Charles II. at Breda. In 1661 he was created a peer as Lord Holles of Ishield in Sussex. His last important public duty was the negotiation of the treaty of Breda in 1667. Although thus employed in the service of the crown, Holles still clung faithfully to his love of liberty, and remained staunch in his support of the governing rights of parliament; and as Charles's propensities towards absolutism became more pronounced Holles leaned more to the opposition. He died on 17th February 1680, a man of firm integrity, a lover of his country and of liberty, 'a man of great courage and of as great pride. He had the soul of a stub born old Roman in him.' See *Memoirs* written by himself (1699); also S. R. Gardiner's *History*.

Holloway, a district of London, in the parish and parliamentary borough of Islington, on the N., has a population of 47,924.

Holloway College, situated at Mount Lee, Egham, Surrey, near Virginia Water, is an institution founded in 1883 by Thomas Holloway (1800–83), patentee of Holloway's pills and Holloway's ointment (see ADVERTISING), for the purpose of supplying a suitable education to women of the middle classes. The building, which is constructed in the French Renaissance style, was opened by the Queen in 1886. The management is vested in the hands of twelve governors. Holloway also founded a sanatorium or hospital for the mentally afflicted belonging to the middle classes.

Holly (*Ilex*), a genus of trees and shrubs of the natural order Aquifoliaceæ, chiefly natives of temperate climates; with evergreen, leathery, shining, and generally spinous leaves; small flowers which have a four- to five-toothed calyx, a wheel-shaped four- to five-cleft corolla, four or five stamens, and the fruit globose and fleshy, with four or five stones (*nuts*). The Common Holly (*I. aquifolium*), the only European species, and a native also of some parts of Asia, is a well-known ornament of woods, parks, and shrubberies in Britain, the stiffness of its habit being so compensated by the abundance of its branchlets and leaves as to make it one of the most beautiful evergreens. It is found as a native plant in Scotland, although Britain is nearly its northern limit; and it attains a greater size and displays greater luxuriance in the northern than in the southern parts of its geographic range, often appearing in the former as a tree of considerable size, 20 to 50 feet high, whilst in the latter it is generally a mere bush. It prefers light soils.

Branch of Common Holly (*Ilex aquifolium*): *a*, a flower.

There are numerous varieties of holly produced, or at least perpetuated, by cultivation, exhibiting great diversity in the leaves, of which the *Hedgehog Holly* may be mentioned as extremely simious and spinous, whilst others are prized for their colour, golden, silver-blotched, &c. The flowers of the common holly are whitish, axillary, nearly umbellate, and often dioecious by abortion of the pistil; hence the barrenness of certain varieties, and occasionally also of individual trees of others which are remarkable for having the stamens only or the pistils only perfect as the case may be; the former of course never bear fruit. The fruit is small, scarlet, rarely yellow or white. The abundance of the fruit adds much to the ornamental character of the tree in winter, and affords food for birds: but to man it is purgative, emetic, and diuretic, and in larger quantities poisonous. The leaves are inodorous, have a mucilaginous bitter and somewhat austere taste, and have been used medicinally in cases of gout and rheumatism, as a diaphoretic, and also as an astringent and tonic to correct a tendency to diarrhœa, &c. The leaves and small branches, chopped, are sometimes used for feeding sheep in severe winters. The root and bark are emollient, expectorant, and diuretic. Birdlime (q.v.) may be made from the inner bark. The wood is almost as white as ivory, very hard and fine-grained, and is used by cabinetmakers, turners, musical-instrument makers, &c., and sometimes for wood-engraving. Handles of tools and handles of metal teapots are very often made of it. The holly is often planted for hedges, as it bears clipping well, and makes an excellent fence. A holly hedge may either be kept low, or, as is the case at Tyninghame, in East Lothian, allowed to grow to the height of 20 or 30 feet. In the gardening of former days hollies were often clipped into fantastic shapes. The name holly used to be derived from the very ancient use of the branches and berries to decorate churches at Christmas (said to be connected originally with the Roman Saturnalia), from which the tree was called Holy Tree. Really holly (O. E. *holyn*) shows the same root as in Irish *cuilean*, German *hulse*, Old French *houlx* (see EVERGREENS, and the illustration there). The American holly (*I. opaca*) is common along the Atlantic coast from Maine southwards.—Maté (q.v.), or *Paraguay Tea*, is the leaf of a South American species of holly (*I. paraguensis*). *I. vomitoria* has been erroneously named *South Sea Tea*, from the impression that it was the same as *I. paraguensis*. The Indians smoked it as a substitute for tobacco. *I. cassine* and *I. Dahoon* are natives of the same region of the United States. *I. gongonha*, which grows in the provinces of Minas Geraes and São Paulo, Brazil, has leaves which have been substituted for Paraguay Tea. The fruit of *I. maconcona* contains a great quantity of tannin, and mixed with a ferruginous earth is used to dye cotton.

According to the Darwinian theory of the origin of thorns, spines, and prickles, these structures serve either as a protection against the attacks of the larger animals (the view expressed in Southey's 'Holly-tree') or as climbing organs. The ancestors of the holly are supposed to have had spineless leaves which were eaten by large browsing animals, and thus the holly ran the risk of extermination, until some individuals, dwarfed and checked in growth from the losing of their tender shoots, developed spines which protected them from the attacks of animals. These spine-producing hollies had an advantage over their spineless neighbours and became the survivors. In support of this theory is the fact that many varieties of holly above a certain height develop leaves without spines; and this is explained by saying that these leaves were beyond the reach of animals which

attacked the plant, and therefore spines were not formed on these higher leaves because they were unnecessary. A more recent view of the origin of spines denies altogether the agency of animals. According to this view the bitter nature of holly leaves is sufficient to repel any animal from making food of them. The presence or absence of spines on the leaves is the result of the metabolism of the plant. Those plants which have grown in rich soil under favourable climatic conditions are vigorous individuals with large spineless leaves; while hollies which have grown in poor soil under unfavourable conditions have shrubby stems and small curled spiny leaves. The former plants are healthy and well fed; the latter half starved and ill conditioned. The former are the highly anabolic, the latter the katabolic individuals.

Hollyhock (*Althæa rosea*), a plant of the natural order Malvaceæ, commonly referred to the same genus with the Marsh Mallow (q.v.). It has a tall, straight, hairy stem; heart-shaped, crenate, wrinkled, five- to seven-angled leaves, and large axillary flowers almost without stalks; the leaves diminishing into bracts, and the upper part of the stem forming a spike; the petals hairy at the base. The hollyhock is a native of the Mediterranean, is to be seen in almost every garden in India, and has been much cultivated in gardens in Britain from a very early period. At present it is a favourite flower, and varieties, the result of cultivation, are very numerous. It varies much in the colour of the flowers, and double and semi double varieties are common. It is an autumnal flower, continuing till the frost sets in. The plant is a biennial or perennial, but in the latter condition lasting only for three or four years in a healthy state. The stem rises to a height of 8-15 feet, unbranching, or nearly so. Since 1870-75 the plant has all but succumbed to what is known as the hollyhock disease, caused by a species of fungus (Puccinia) which attacks the leaves and finally proves fatal, unless prompt measures are adopted to arrest its progress. Sulphur dusted on the affected leaves has proved the most effectual cure. The fibres of the plant have been made into yarn, but it is not yet certain if it is really valuable for cultivation on this account, or for the manufacture of paper. It is not improbable that it might be cultivated with advantage to afford green fodder for cattle, which are very fond of its leaves, and the leaves are produced in great abundance if the plant is prevented from flowering. The flowers are mucilaginous and demulcent, and are sometimes used like those of mallows and marsh mallows. The leaves yield a fine blue dye.—The Chinese Hollyhock (*A. chinensis*) is an allied species.

Hollyhock (*Althæa rosea*).

Holman, James, 'the Blind Traveller,' was born 15th October 1786, and, entering the navy in 1798, had risen to be a lieutenant when, in 1810, the loss of sight compelled him to quit the service. Yet, being of an active temperament, he in 1819-21 travelled through France, Italy, and the countries touching on the Rhine. Encouraged by this, he conceived the plan of travelling round the world, and had penetrated to Irkutsk in Siberia, when he was arrested as a spy by the Russian government and carried back to the frontiers of Poland. Nevertheless, undaunted by this failure, he again set off in 1827, and this time effectively accomplished his purpose. Finally, he visited the countries of south-east Europe. He died at London, 29th July 1857. He published *Journals* of his successive journeys, which contain much more useful information than could be expected from the circumstances under which it was gathered.

Holmby House, a fine Tudor mansion, 6½ miles NW. of Northampton, was built by Sir Christopher Hatton in the reign of Elizabeth. It was sold to James I., and was for four months in 1647 the prison of Charles I. (q.v.). It was dismantled in 1652.

Holmes, Oliver Wendell, born in Cambridge, Massachusetts, August 29, 1809, was the son of Rev. Abiel and Sarah (Wendell) Holmes. His father was a Congregational [illegible] minister, the author of *Annals of America* and other works; his mother, descended from a Dutch ancestor, was related to many well-known families in New England and New York. He entered Harvard College at the age of sixteen, and graduated, in what became a famous class, in 1829. He began the study of law, but after a year gave it up, and entered upon the study of medicine. After the customary course at the medical school of Harvard he spent over two years in the hospitals and schools of Europe, chiefly in Paris; and on his return home took the degree of M.D. in 1836. Three years later he was professor of Anatomy and Physiology at Dartmouth College, but after two years' service he resigned and engaged in general practice in Boston. He married in 1840 Amelia Lee Jackson, daughter of a justice of the Supreme Court of Massachusetts. (Three children were born of the marriage, of whom one, O. W. Holmes, jun., served as a captain in the civil war, and is a judge and an eminent writer upon legal subjects.) In 1847 he was appointed professor of Anatomy at Harvard, which place he held until 1882. He was highly respected as a man of science, and beloved as an instructor; but as time went on his literary genius quite overbore his professional zeal, and it is as a poet and essayist that he will be remembered.

He began writing verse while an undergraduate, but his first efforts were not remarkable. While in the law school he contributed to the *Collegian* a few poems of a light and humorous character which first gave indications of his future power; among these are 'Evening, by a Tailor' and 'The Height of the Ridiculous.' There is a reminiscence of his life in Paris in the tender poem beginning 'Ah, Clemence! when I saw thee last.' A little later was written 'The Last Leaf,' which contains one perfect stanza, and which from the blending of quaintness and pathos is perhaps the most fortunate and characteristic of his minor poems. For some years the muse visited him by stealth, the votary fearing for his professional reputation in a town so noted for propriety. A small volume of these early poems was published in 1836. Twenty years passed with desultory efforts and a slowly-growing power, when by the publication of *The Autocrat of the Breakfast Table* (1857-58) he became suddenly famous. No literary event since the *Noctes* had more strongly affected the reading world. The success was due

to its fresh, unconventional tone, its playful wit and wisdom, and to the lovely vignettes of verse. Apart from the merits of thought and style, the pages have the charm of personal confidences; the reader becomes at once a pupil and an intimate friend. The tone assumed is egotistical, but the force and the comedy (as every man with imagination sees) are bound up in that assumption. *The Professor at the Breakfast Table* (1858-59) was written upon the same lines and has qualities equal to those of its predecessor, but it deals with deeper questions and in a less familiar way. *The Poet at the Breakfast Table* (1872) takes the reader into the region of religious and philosophical ideas. 'God is Love' is the keynote of its doctrine. His first effort in fiction was *Elsie Venner* (1859–60), a study of hereditary impressions and tendencies. *The Guardian Angel* (1867) is a picture of rural New England. *A Mortal Antipathy* was written in 1885. It is scarcely a novel as the term is generally understood, but there is a thread of story on which the author hangs his observations, as he had done before in the Autocrat. The introduction to this book is autobiographical and historical, and gives a delightful view of Cambridge as it was in the author's boyhood, and a sadly amusing account of early American literature. The works before named appeared in the *Atlantic Monthly*, of which he was one of the founders. He wrote for it also many occasional essays and poems. Besides the early volume (1836), he published *Songs in Many Keys* (1862), *Songs of Many Seasons* (1875), *The Iron Gate* (1880), and *Before the Curfew* (1888). His other (prose) works are *Currents and Counter-currents* (1861), *Soundings from the Atlantic* (1864), *Border Lines of Knowledge* (1862), *Mechanism in Thought and Morals* (1871), and Memoirs of Motley (1879) and Emerson (1885). *Our Hundred Days in Europe* (1887) is an account of a visit made in 1886, during which he received honours from the universities of Cambridge, Oxford, and Edinburgh. The article EMERSON in this work is from his pen. Universally beloved, he died peacefully in his arm-chair in his library overlooking Cambridge, on the 7th October 1894.

It is difficult to make a summary of the traits of a writer so versatile. By his own generation he will be remembered as a great talker, in the highest sense. His intellect was keen and powerful; his observation instinctive; and his enthusiasm and energy would have carried through a man of less brilliant parts. His verse is melodious, compact, and rounded by art; its Gallic liveliness tempered by the even measure, and enforced by the point, of the 18th century. There is not in it a trace of the manner of recent English poets. Still, in its thought, its humanity, and its suggestions of science, it is seen that he is a man of his own century, and among the most advanced. Among specimens of his varied powers may be cited 'The Last Leaf,' already mentioned, 'The Chambered Nautilus,' 'Grandmother's Story' (of the battle of Bunker's Hill), 'Sun and Shadow,' 'For the Burns Centennial,' 'On lending a Punch-bowl,' and 'The One-hoss Shay.' He is especially happy in his tributes to brother poets as to Longfellow and Lowell, and to Whittier on his seventieth birthday. During the civil war he wrote many impassioned lyrics in defence of the Union—probably the best patriotic songs of the time. Of his prose it may be said that, whatever may be the subject, it always engages attention, and is always *sui generis*. The reader feels himself in contact with a strong mind, full of the fruit of reading, and with a character that is full of surprises. The choice of words is directed by a poet's inevitable instinct, and the general treatment is both precise and delicate. In the essay upon *Mechanism in Thought and Morals* there is an acuteness and subtlety which might have made a metaphysician; only that might have deprived the world of one of its most original and delightful essayists. There are degrees of value in his works, but it appears that his fame will rest chiefly upon The Autocrat, The Professor, and certain of his poems. Of his writings in general it should be said that, though his sparkling wit and flowing humour are evident to the most casual reader, a closer study reveals other qualities which give him a place among the great writers of the time.

The collected ('Riverside') edition of his works extends to 13 vols. (1891-92). There are Lives by W. S. Kennedy (1883), Emma E. Brown (1884), and J. T. Morse, jun. (2 vols. 1896).

Holocephali. See CARTILAGINOUS FISHES.

Holofernes. See JUDITH.

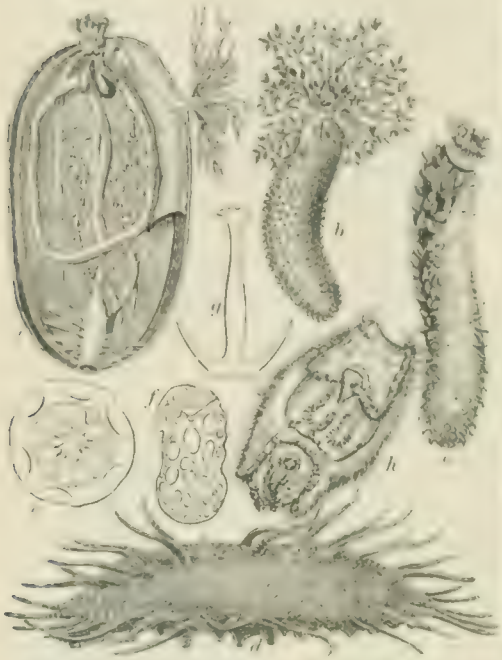
Holograph. See DEED.

Holoptychius (Gr. *holos*, 'all,' and *ptyche*, 'wrinkle'), an extinct genus of Ganoid fishes from Devonian and Carboniferous strata, type of a family the members of which are remarkable for their sculptured or wrinkled scales and extraordinary labyrinthine tooth structure.

Holothurians (*Holothurioidea*), a class of animals belonging to the sub-kingdom Echinodermata (q.v.), from the other members of which they are readily distinguished by a more or less worm-like appearance. They are popularly known as Sea-cucumbers or Sea-slugs. The word *holothourion* was used by Aristotle for a marine animal which we are now unable to identify, and the Latinised form was appropriated as a generic title by Linnæus in 1758. His genus was practically co-extensive with the present class. As in all Echinodermata, the symmetry of the adult body is apparently pentagonal, but, instead of presenting the appearance of rays diverging in one plane from a common centre, these are bands running along the sides of a cylinder. Very frequently they are not equidistant from each other, and then the radiate symmetry passes over into a bilateral one. The most common arrangement is for three rays to be approximated to each other on the ventral and two on the dorsal aspect. The body of a Holothurian consists of a sac of leathery consistency (whence the name Scytodermata sometimes used for them), made up of a cuticle, layers of cells, connective tissue, nerve-fibres, and calcareous plates and muscles. The calcareous plates are the sole remnants of the skeleton which is so largely developed in other Echinoderms. They are of various shapes, resembling wheels in Chirodota, plates and anchors in Synapta, and spines in some other genera; in Psolus there are overlapping scales. The mouth is ordinarily at one end of the body, but occasionally on the ventral surface; it is surrounded by a ring of tentacles whose number is some multiple of five, and opens into a gullet surrounded by a circle of calcareous plates. The digestive tract is ordinarily disposed in a loop; the last portion before the vent (cloaca) is a large space, which has been observed to contract rhythmically. To it are appended (except in two subdivisions) a pair of branched outgrowths, the respiratory trees, and certain processes of unknown function, known as the Cuvierian organs.

The gullet is surrounded by the ring-shaped central nervous system, and also by a tube belonging to the ambulacral or water-vascular system, which is so generally distributed among the Echinodermata. It gives off a branch forwards to each tentacle, and sends one backwards along each of the five radii of the body, to supply the tube-feet, the principal locomotor organs. The annular tube bears also a reservoir, the Polian vesicle, and communicates either with the body-cavity, or sometimes with the outside by means of a canal. The sense-

organs consist of auditory vesicles situated near the anterior end of the body, and containing small calcareous corpuscles (otoliths), and of the tentacles above mentioned. These may be either simple or



a, Semi-diagrammatic view of the viscera of a Holothurian, belonging to the Aspidochirotæ. Projecting from the upper end are the tentacles; lower down the calcareous ring, and still lower on the middle line the two Polian vesicles. The intestine is shown passing mid-loop to the hinder end of the body during part of its course. It is seen to be attached to the body wall by a mesentery. Two respiratory trees open into the expanded termination or cloaca, which is connected to the walls of the body by radiating muscular bands. Longitudinal muscles pass from the anterior to the posterior end of the animal. To the right is the branched genital gland with its duct. (From Leuns.)

b, [illegible], one of the Dendrochirotæ, ¼ nat. size (from Lemoine); *c*, *H. Thomsoni*, Gosse, one of the Aspidochirotæ, ⅓ nat. size (from Lemoine); *d*, [illegible], one of the Elasipoda, ½ nat. size (from Theel); *e*, adolescent echinoplutei, from the enlargement of [illegible], magnified ten diameters (from Thorell); *f*, pluteus and auricle of *Synapta inhærens*, highly magnified (from Thorell); *g*, larval form (Auricularia) of *H. tubulosa* (Gmel.), highly magnified (from Selenka)

branched, and in a few cases they are furnished with suckers. In the Elasipoda tactile organs are present in the form of dorsal papillæ.

The generative organs consist of a bunch of tubes, with one end closed; their duct opens either within or just outside the circle of tentacles. The egg develops as a rule into a curiously formed bilaterally symmetrical larva, formerly described as a distinct animal under the name Auricularia. In a few cases the development is direct; in *Cucumaria crocea* the young are borne among the tentacles of the parent, whilst in *Psolus ephippifer* they are carried in a special pouch on the back.

The class is subdivided as follows:

I. Elasipoda, pelagic deep-sea forms, bilaterally symmetrical, tube-feet on the ventral surface, papillæ on the dorsal. No respiratory trees. A very large number of genera and species have been obtained by the *Challenger* and other deep-sea expeditions.

II. Pedata, with tube-feet and tentacles, but no papillæ.

(1) Aspidochirotæ, with tentacles bearing a disc, and ten calcareous plates round the gullet. The genus Holothuria as now understood belongs here.

(2) Dendrochirotæ, with arborescent tentacles [illegible]

III. Apoda, devoid of tube-feet and papillæ.

(1) Pneumophora, with respiratory trees, e.g. Molpadia. (2) Apneumona, with neither radial water-vascular canals, respiratory trees, nor Cuvierian [illegible], e.g. Synapta, Chiridota.

The Holothurians are all marine, and have a world-wide distribution; traces of them have been found fossil as far back as the Carboniferous deposits of Scotland. They either take in large quantities of sand and absorb the nutritive matters mixed with it, or devour small animals. On strong contraction, caused by sudden irritation, the whole digestive canal and its appendages are not unfrequently ejected; but these are regenerated after a time. In some species the cloaca is inhabited by a small parasitic fish of the genus Fierasfer. Trepang (q.v.), or *bêche-de-mer*, a great delicacy among the Chinese, consists of dried Holothurians.

Holstein, formerly a duchy belonging to Denmark, and at the same time a member of the Germanic Confederation, was annexed in 1866 to Prussia, which incorporated it in the province of Sleswick Holstein. It is separated from Sleswick on the N. by the river Eider and the North Baltic Canal; is bounded on the E. by the Baltic Sea, the territory of Lübeck, and the duchy of Lauenburg; on the S. by the Hamburg territory and the Elbe; and on the W. by the North Sea. One-eighth of the surface consists of marshes. The central districts are occupied by an undulating plain traversed from north to south by a low heathy and sandy ridge. The soil, with the exception of several tracts of sand and heath, is very fruitful, especially in the marshes. The climate and natural productions closely resemble those of similar districts in the north of Germany. Salt and gypsum are the only minerals found. Peat is plentiful. Agriculture and the rearing of cattle are the chief employments, though market-gardening flourishes in the neighbourhood of Altona and Hamburg, and shipping in the seaport towns, and fishing along the coasts, especially for oysters in the North Sea. Area, 3237 sq. m.; pop. about 560,000 mostly Germans of the Low German stock. The history of Holstein will be noticed under SLESWICK.

Holsten, KARL CHRISTIAN JOHANN, an eminent Protestant theologian, born at Güstrow in Mecklenburg-Schwerin, 31st March 1825. He studied theology and philology at Leipzig, Berlin, and Rostock, and became in 1852 a teacher at the Rostock gymnasium. In 1870 he was called to the Bern High School as an extra-ordinary professor, next year became ordinary professor, and in 1876 obeyed a call to a similar post at Heidelberg. His startling contribution to Pauline theology, *Zum Evangelium des Paulus und Petrus* (1867), was followed by *Das Evangelium des Paulus* (vol. i. 1880), *Die drei ursprünglichen, noch ungeschriebenen Evangelien* (1885), and *Die Synoptischen Evangelien nach der Form ihres Inhalts* (1886). He died 27th Jan. 1897.

Holt, SIR JOHN, Lord Chief justice of the Court of King's Bench, was born at Thame in Oxfordshire, on 30th December 1642. After leading a wild life as a student of Oriel College, Oxford, he entered at Gray's Inn, reformed his manners, and was called to the bar in 1663. He figured as counsel in most of the state-trials of that period, and generally as pleader for the defendants. In 1686 he was made recorder of London and king's serjeant, and was knighted. On the accession of William III. he was raised to the dignity of lord chief-justice of the King's Bench, and filled the post to his life's end. He died 3d March 1710. Sir John Holt occupies an honourable place among the dignitaries of the English bench on two accounts. Contrary to the practice of his predecessors, he treated those who appeared before him with uniform fairness and justice. Although politically a Whig, Holt's judi-

cial career was entirely free from the stigma of party bias or intrigue. He distinguished himself by his courageous defence of the powers of his office against both crown and parliament, and his decisions were marked by conspicuous ability and unbending integrity. See *Life* (1764) and *Reports of Cases determined by Sir John Holt from 1688 to 1710* (1738).

Holtzendorff, Franz von, a German writer on law subjects, was born 14th October 1829, at Vietmannsdorf in Brandenburg. Educated for the law, he practised in the courts at Berlin till 1857, when he became a lecturer on law at the university. Made professor there in 1861, he was in 1873 called to Munich. He is known as an author on several branches of law, and especially as an advocate for the reform of prisons and penal systems. Among his numerous works may be mentioned one on deportation, and another on the Irish prison system (1859); *Die Prinzipien der Politik* (1869); *Encyclopädie der Rechtswissenschaft* (1870-71; 4th ed. 1882); *Handbuch des Deutschen Strafrechts* (1871-77); and *Handbuch des Völkerrechts* (1885).

Holtzmann, Adolf, a celebrated Germanist, was born at Carlsruhe, 2d May 1810, first studied theology at Berlin, then Old German philology under Schmeller at Munich, and next Sanskrit under Burnouf at Paris. In 1852 he was appointed professor of the German Language and Literature at Heidelberg, where he died, 3d July 1870. Among his numerous contributions to philology are *Ueber den griech. Ursprung des Ind. Tierkreises* (1844); *Ind. Sagen* (1845-47); *Kelten und Germanen* (1855), in which both are maintained to have been originally identical; and *Untersuchungen über das Nibelungenlied* (1854), in which the views of Lachmann are assailed. His last work was a projected *Altdeutsche Grammatik*. After his death Holder edited from his papers *German. Altertumer* (1873), *Deutsche Mythologie* (1874), and *Die ältere Edda* (1875). - Of his brothers two attained eminence, Karl Heinrich Alexander (1811-65) as a lecturer and writer on applied mathematics; and Karl Julius (1804-77) as a preacher and ecclesiastic at Carlsruhe.

Holtzmann, Heinrich Julius, an eminent theologian, was son of the Germanist Adolf Holtzmann. He was born at Carlsruhe, 17th May 1832, became in 1861 extra-ordinary, in 1865 ordinary professor of Theology at Heidelberg, and obeyed in 1874 a call to the theological faculty at Strasburg. Holtzmann set out as an exponent of the 'Vermittelungtheologie,' but gradually let slip its assumptions, and now stands one of the chief representatives of the more advanced modern school.

Among his writings are *Kanon und Tradition* (1859), *Die Synoptischen Evangelien* (1863), *Kritik der Epheser- und Kolosserbriefe* (1872), *Die Pastoralbriefe* (1880), and an introduction to the New Testament (1885). Besides these he prepared the New Testament portion of Bunsen's *Bibelwerk*; published two volumes of sermons (1865 and 1873); along with G. Weber, *Geschichte des Volkes Israel* (1867); and with Zopffel, the *Lexikon für Theologie und Kirchenwesen* (1882). He has also contributed extensively to the theological reviews.

Holy Alliance, a league formed (1816) after the fall of Napoleon by the sovereigns of Russia, Austria, and Prussia, whereby they pledged themselves to rule their peoples like fathers of families, and to regulate all national and international relations in accordance with the principles of Christian charity. But the alliance was made in actual fact a means of mutual encouragement in the maintenance of royal and imperial absolutism, and an instrument for suppressing free institutions and checking the aspirations for political liberty struggling into realisation amongst the nations of the Continent. The league died a natural death after the lapse of a few years.

Holy Coat of Treves. See Treves.

Holy Ghost. See Spirit, Creeds.

Holy Grail. See Grail.

Holy Grass (*Hierochloe borealis*), a sweet-smelling grass belonging to the tribe Phalarideæ, about a foot high, with a brownish glossy lax panicle. It is sometimes strewed on the floors of churches on festival-days, whence its name.

Holyhead, a seaport (once a parliamentary borough) of Anglesey, North Wales, is situated on a small island of the same name, 60 miles E. of Dublin, 85 W. of Chester, and 264 NW. of London. Although recently much improved, it is still a primitive, irregularly-built town. It is the terminus of the London and North-Western Railway (1850), and the port for the mail steam-packets to Dublin, which perform the voyage in about four hours. The shipping accommodation consists of a harbour with two divisions, and a roadstead sheltered by a breakwater. The harbour was extended in 1873-80, and the quay lengthened to 4000 feet. The roadstead or harbour of refuge (1847-73), with an area of about 400 acres, is protected from the sea on the north by a solid masonry wall, rising 38 feet 9 inches above low-water mark, and backed by a strong rubble mound (see Breakwater, Vol. II. p. 413). Pop. (1875) 5622; (1891) 8726, employed in the coasting trade and in shipbuilding and rope-making. Till 1885 Holyhead united with Amlwch, Beaumaris, and Llangefni in sending one member to parliament.

Holyhead Island, lying west and forming part of Anglesey, is 8 miles long by 3½ broad. Area, 9658 sq. acres; pop. (1891) 9616. The island is separated from Anglesey by a narrow sandy strait, crossed by a causeway, along which run the Holyhead road and the Chester and Holyhead Railway, and arched in the centre for the tide to pass beneath. The surface is for the most part rocky and barren. On the north-west coast are two islets, the North and South Stacks, the latter with a lighthouse, whose light, 197 feet above high-water, is seen for 20 miles. The Stacks and the north coast are hollowed out into magnificent caves, the haunt of sea-fowl.

Holy Island, or Lindisfarne, a small island of Northumberland, 9½ miles SE. of Berwick-on-Tweed. It is 3 miles long by 1½ broad, and has an area of 2457 acres. At low-water it can be reached by walking across the sands, a distance of 3½ miles; at high-water the strait covered by the sea is 1½ mile wide. The village (pop. 686) is guarded by the castle, built about 1500, and still in good repair. The island is chiefly interesting for the ruins of its Benedictine priory church. This was built in 1093 out of the materials of the ancient cathedral, erected here in the 7th century, under the auspices of Bishop Aidan. Here a company of Columban monks established themselves, and grew into the famous priory of Lindisfarne, the luminary of the north, the Iona of England. It reached its greatest glory under St Cuthbert (q.v.). The cathedral suffered severely from the ravages of the Danes, and was gradually allowed to fall into ruins as Durham grew into importance. In August 1887 three thousand barefooted pilgrims crossed the sands to Lindisfarne. See works by G. Johnston (1853) and F. R. Wilson (1870).

Holy Land. See Palestine.

Holyoake, George Jacob, a zealous labourer for bettering the condition of working-men, a writer on co-operation, and the founder of 'Secularism, a system which bases duty on considerations purely human, relies on material means of improvement, and justifies its beliefs to the conscience, irrespective of atheism, theism, or revelation.' He was born at Birmingham on 13th April 1817. During the

course of his life he has filled various offices and taken an active share in various public movements. He taught mathematics at the Mechanics Institution in Birmingham, lectured on Robert Owen's socialist system, acted as secretary to the British contingent that went to the assistance of Garibaldi, edited the *Reasoner*, was chiefly instrumental in getting the bill legalising secular affirmations passed, projected the light on the clock tower of the Parliament House, and exerted himself on behalf of settlers in Canada and the United States, services recognised by Mr Gladstone and the Canadian government. Holyoake was the last person imprisoned in England on a charge of atheism (1841). He was president of the Carlisle Congress of the Co-operative Societies, 1887. On the subject of co-operation he has written *History of Co-operation in Rochdale* (2 parts, 1857-72), *History of Co-operation in England* (2 vols. 1875-79; new ed. vol. i. 1886), and *Self-help a Hundred Years Ago* (1888). Other works from his pen are *The Limits of Atheism* (1861), *Trial of Theism* (1877), *Life of Joseph Rayner Stephens* (1881), *Hostile and Grotesque Toleration*, a *History of Middlesborough*, *Sixty Years of an Agitator's Life* (1892), &c.

Holyoke, a city of Massachusetts, 8 miles N. of Springfield, on the Connecticut River, which is here crossed by a dam over 1000 feet long and falls 60 feet in less than a mile, supplying immense water power. Holyoke is a great seat of the paper-making trade, and has a score of paper-mills, besides numerous cotton-factories and woollen-mills, several grist-mills, and manufactures of metal and wooden wares. It contains a fine city-hall of granite, and a large number of excellent schools. Pop. (1870) 10,733; (1890) 35,637.

Holy Roman Empire. See ROMAN EMPIRE, CHURCH HISTORY.

Holyrood, an abbey and palace of Edinburgh. In the year 1128 King David I. of Scotland founded at Edinburgh an abbey of canons regular, of the order of St Augustine. According to the legend, it was founded on the spot where the king, whilst hunting on Rood Day in the fourth year of his reign, in the forest that then surrounded Edinburgh, was thrown from his horse and nearly gored by a hart, and was only saved by a mysterious hand putting a flaming cross between him and the animal, at the sight of which the hart fled away, leaving the king safe. The abbey was dedicated to the Holy Cross or Rood, a casket of gold, elaborately wrought and shaped like a cross, which was brought to Scotland by Margaret, wife of Malcolm, king of Scotland, about 1070. This casket was held in great veneration as containing a splinter of the true Cross, and became one of the heirlooms of the kingdom. The Black Rood of Scotland, as it was called, was carried before the army of David II. when he invaded England in 1346, and fell into the hands of the English at the battle of Neville's Cross. The victors placed it in the shrine of St Cuthbert in the cathedral of Durham. At the time of the Reformation it disappeared, and nothing has been known about it since. The abbey church was built in the Norman and early Gothic styles. The abbey was several times burned by the English, especially in 1544 (when the transepts were destroyed) and 1547. At the Reformation the monastery was dissolved; and the abbey church having been repaired was henceforth used as the parish church of the Canongate. In 1687 James VII., having built another parish church for the Canongate, converted the abbey church into the chapel royal of Holyrood. It was plundered and burned by the mob at the Revolution in 1688, and remained in neglect until 1758. In that year it was repaired and roofed; but the roof was too heavy for the walls, and it fell in 1768. Since then the chapel has been left in a state of ruin. The vault, built as a burying-place for the royal family of Scotland, contained the ashes of David II., James II., James V., and of many other royal and historical personages, such as the Duke of Albany, Lord Darnley, &c.

The abbey of Holyrood early became the occasional abode of the Scottish kings. Robert Bruce and Edward Baliol held parliaments within its walls. James II. was born in it, crowned in it, married in it, buried in it. The foundations of the palace, apart from the abbey, were laid about 1501 by James IV., who made Edinburgh the capital of Scotland. Henceforth Holyrood Palace was the chief seat of the Scottish sovereigns. It was mostly destroyed by the English in 1544, but immediately afterwards rebuilt on a larger scale. Queen Mary took up her abode in the palace when she returned from France in 1561. Here, in 1566, Rizzio was torn from her side and murdered. It was garrisoned after the battle of Dunbar in 1650 by Cromwell's troops, who burned the greater part of it to the ground. It was rebuilt by Charles II., from the designs of Sir William Bruce of Kinross, between 1671 and 1679. After the accession of James VI. to the throne of England it ceased to be occupied as a permanent royal residence. But George IV. held his court in it in 1822, and Queen Victoria occasionally spends a night within its walls. At the present day the disposition of the rooms in the older portion seems to be much the same as in the time of Queen Mary. The picture-gallery, containing badly-painted 'portraits' of fabulous Scottish kings, and a few genuine works of art, possesses romantic interest as the scene of the balls and receptions of Prince Charlie in 1745.

The palace, with its precincts and park, was in Catholic times a sanctuary for all kinds of offenders, but afterwards the privilege of Sanctuary (q.v.) was extended to none except insolvent debtors. De Quincey is the most illustrious person who availed himself of the privilege. But now, from recent ameliorations in the laws affecting debtors, especially the Debtors (Scotland) Act, 1880, the protection has no longer legal validity. See *Historical Description of the Monastery and Chapel Royal of Holyrood House* (1819), and D. Wilson, *Memorials of Edinburgh* (1848).

Holy Sepulchre, KNIGHTS OF THE, an order of knighthood instituted, probably by Pope Alexander VI., for the guardianship of the Holy Sepulchre, and the relief and protection of pilgrims. On the recapture of Jerusalem by the Turks the knights retired to Italy, and settled at Perugia. For a time united with the Hospitallers, the order was reconstituted (1814) in France and in Poland.

Holy Spirit. See SPIRIT.

Holy Water, in the Roman Catholic, as also in the Greek, Russian, and oriental churches, signifies water blessed by a priest or bishop for certain religious uses. Water is, almost of its own nature, a fitting symbol of purity; and accordingly, in most of the ancient religions, the use of lustral or purifying water not only formed part of the public worship, but also entered largely into the personal acts of sanctification prescribed to individuals. The Jewish law contained many provisions to the same effect; and our Lord, by establishing baptism with water as the necessary form of initiation into the religion instituted by him, gave his sanction to the use. The usage of sprinkling the hands and face with water before entering the sanctuary, prescribed in the Jewish law for those ceremonially unclean, was very early adopted in the Christian church. It is expressly mentioned by

Tertullian in the end of the 2d century. And that the water so employed was blessed by the priests we learn from St Jerome, among others, and from the Apostolical Constitutions. Although it is difficult to fix the precise time, it cannot be doubted that the practice of mingling salt with the water is of very ancient origin. In the Western Church there is a solemn blessing of water in the service of Holy Saturday, but the ceremonial is repeated by the priest whenever necessary. Holy water is placed in Benitiers (q.v.) at the doors of churches that worshippers may sprinkle themselves with it; before high mass on Sundays the celebrant sprinkles the people with holy water; and it is used in nearly every blessing given by the church. Instructed Catholics regard the use of holy water chiefly as a means of suggesting to the mind the necessity of internal purity; and although it is supposed to derive from the blessing a special efficacy for this end, yet this efficacy is held to be mainly subjective and of a character entirely distinct from that ascribed to the sacramental rites of the church. See BENEDICTION.

Holy Week, the week immediately preceding Easter, and specially consecrated to the commemoration of the Passion of our Redeemer. This institution is of very early origin, and the name Holy Week is but one of many by which its sacred character has been described. In English use it is called 'Passion Week' (a name appropriated, in Roman use, to the week before Palm Sunday). It was also called the 'Great Week,' the 'Silent Week,' the 'Week of the Holy Passion,' the 'Vacant Week,' the 'Penitential Week.' In the Roman Catholic Church the special characteristics of the celebration of the Holy Week are increased solemnity and gloom, penitential rigour, and mourning. If any of the ordinary church festivals fall therein, it is deferred till after Easter. All instrumental music is suspended in the churches, the altars are stripped of their ornaments, the pictures and images are veiled from public sight; manual labour, although it is no longer entirely prohibited, is by many persons voluntarily suspended; the rigour of fasting is redoubled, and alms-deeds and other works of mercy sedulously enjoined and practised. All church services of the week, moreover, breathe the spirit of mourning, some of them being specially devoted to the commemoration of particular scenes in the Passion of our Lord. The days thus specially solemnised are Palm Sunday, Spy Wednesday, Holy (or Maundy, q.v.) Thursday, Good Friday (q.v.), Holy Saturday. Holy Thursday in the Roman Catholic Church is specially designed as a commemoration of the Last Supper, and of the institution of the eucharist, although there are several other features peculiar to the day. To Holy Saturday belongs the solemn blessing of fire and of the water of the baptismal font; and from the earliest times it was set apart for the baptism of catechumens, and for the ordination of candidates for the ecclesiastical ministry. From the 'new fire,' struck from a flint, and solemnly blessed on this day, is lighted the Paschal Light, which is regarded as a symbol of Christ risen from the dead. This symbolical light is kept burning during the reading of the gospel at mass throughout the interval between Easter and Pentecost. It must be added, however, that in many instances the primitive institution of the Holy Week was perverted, and that the suspension of labour, designed for purposes of devotion, was turned into an occasion of amusement not infrequently of a very questionable character. Such abuses are now universally discountenanced by the ecclesiastical authorities. See FASTS, FESTIVALS; and Feasey's *Ancient English Holy Week Ceremonial* (1897).

Holywell (Welsh *Treffynnon*), a parliamentary borough and market-town of Flintshire, North Wales, on an eminence 15 miles NW. of Chester. It is the seat of numerous lead, iron, copper, and zinc mines, and has smelting-works for the extraction of these metals, manufactures of paper, flannel, and Roman cement, and tanyards and breweries. The borough unites with those of Flint, Mold, &c. in returning one member to parliament. Pop. (1881) 3090; (1891) 3018. Holywell owes its origin to the renowned well of St Winifred, which, until diminished by drainage works, was estimated to deliver 4700 gallons of water per minute. The Perpendicular chapel over the well is attributed to Margaret, mother of Henry VII. It is still a place of pilgrimage for Roman Catholics. See Pennant's *History of Holywell* (1796).

Homage (Old Fr.; Low Lat. *homaticum*; Lat. *homo*, 'man') is the service due from a knight or vassal to his lord in feudal times, the vassal professing to become his lord's man. See FEUDALISM.

Homburg, or HOMBURG VOR DER HÖHE, a town in the Prussian province of Hesse-Nassau, is situated at the foot of the Taunus Mountains, 8 miles NNW. of Frankfort-on-the-Main. It has beautiful environs, and is frequented by about 12,000 visitors annually on account of its mineral waters. The springs, five in number, possess saline and chalybeate properties. They are considered effective in cases of disordered liver and stomach, for hæmorrhoidal and menstrual disorders, and for gout, rheumatism, scrofula, and skin diseases. About 400,000 bottles are sent away annually. The gaming-tables were suppressed in 1872. Pop. (1875) 8294; (1895) 9274. See works by Schick (14th ed. 1885) and Will (1880).

Home, the name of one of the oldest and most celebrated of the historic families of Scotland. After the Conquest Cospatrick, the great Earl of Northumberland, took refuge in Scotland, and received from Malcolm Canmore the manor of Dunbar, and large estates in the Merse and the Lothians. Patrick, the second son of the third Earl of Dunbar, inherited from his father the manor of Greenlaw, and having married his cousin, daughter of the fifth earl, obtained with her the lands of Home, from which his descendants took their designation. After the overthrow of the earls of Dunbar and March in 1436 the Homes succeeded to a portion of their vast estates and to a great deal of their power on the eastern Marches. Sir Alexander Home was created a peer by James III.; but, disappointed in his attempt to appropriate the revenues of Coldingham Priory, he joined the disaffected nobles who rebelled against James, and took part in the battle of Sauchieburn, where the king was killed. The second baron obtained estates and important offices from James IV. Along with Lord Huntly he commanded the vanguard of the Scottish army at Flodden, and routed the English right wing. He was almost the only Scottish noble who returned unhurt from that battle. He was induced by fair promises from the Regent Albany to visit Holyrood along with his brother William in 1516, and they were arrested, tried for treason, and condemned and executed. The forfeited title and estates were restored to his brother George in 1522; but, though the family took a prominent part in public affairs during the troublous times of Queen Mary and the great civil war, they never regained their former influence. Their extensive estates dwindled down to a patrimony of 2000 acres, and they sank into insignificance. But the marriage (1832) of the eleventh earl to the heiress of the Douglas estates restored the decayed fortunes of this ancient house. These estates now,

according to the Doomsday Book, yield a rental of £47,721 a year.

Home, DANIEL DUNGLAS, spiritualist, was born near Edinburgh, March 20, 1833, and was taken by an aunt to the United States, where by 1850 he had become a famous medium. He began the study of medicine, but was persuaded by his friends to practise spiritualism instead; and in 1855 he removed to London to carry on his 'mission.' Home was a proficient in mesmerism and such like sciences, and to table-turning and spirit-rapping he added, for advanced disciples, speaking ghosts, and a display of his own powers of floating in the air. He made many converts, though not all the great people he claimed. He was presented at several courts, and to the pope; and he joined the Roman Catholic Church, but was ultimately expelled for spiritualistic practices. In 1866 he acceded to a Mrs Lyon's suggestion that he should become her adopted son, she assigning to him £60,000; but this money his fickle patroness afterwards compelled him to restore, and the lawsuit discredited Home greatly, though he was scarcely to blame in the matter. He died at Auteuil, 21st June 1886. He published two series of *Incidents of my Life* (1863 and 1872), and *Lights and Shadows of Spiritualism* (1877); see also *D. D. Home: his Life and Mission* (1888), and a continuation, *The Gift of D. D. Home* (1890), both by his widow.

Home, HENRY. See KAMES (LORD).

Home, JOHN, a Scotch clergyman and dramatist, was born at Leith in 1722. He graduated at the Edinburgh University in 1742, and three years later entered the church. He was present as a volunteer on the king's side when the royalists were routed by the young Pretender at Falkirk, and was carried a prisoner to the castle of Doune, whence he effected his escape. In 1747 he was appointed minister of Athelstaneford, near Haddington, where he produced in 1747 the tragedy of *Agis*, and, after the lapse of five years, *Douglas*, a tragedy founded (before the publication of Percy's *Reliques*) on the ballad of Gil Morrice. Each of these plays was successively rejected by Garrick; but *Douglas*, brought out at Edinburgh, met with instant and brilliant success, and evoked equal enthusiasm when placed on the London boards. Its production, however, gave such offence to the Presbytery that the author thought fit to resign his ministry, and, withdrawing into England, he became private secretary to the Earl of Bute, who procured him a pension of £300 a year. The success of *Douglas* induced Garrick not only to accept Home's next play, *The Siege of Aquileia*, but to bring out the earlier work, *Agis*. Home's other works are *The Fatal Discovery*, *Alonzo*, *Alfred*, occasional poems, and, in prose, *A History of the Rebellion of 1745*. He died in 1808.

Home is the last of our tragic poets whose works for any time held the stage. The drama, purified from the licentiousness of Wycherley and Congreve, had become frigid and lifeless in the hands of Addison, Rowe, and Johnson, and the enthusiasm with which *Douglas* was greeted was due to the generous warmth of domestic feeling, the chivalrous ardour and natural pathos which Home infused into his work. His writings are remarkable for the interesting character of their plots, for lucidity of language, and for occasional flashes of genuine poetry; but he did not succeed in entirely discarding the pompous declamation of his forerunners. In his day he enjoyed the praise of all and the friendship of the most distinguished; Collins dedicated to him his ode on the Highland superstitions, and Burns, with more zeal than judgment, said that he

> [illegible]

The taste of the time is not that of ours, but the dramatists who displaced him turned to comedy, and he has had no successor of equal fame. See the Life by Henry Mackenzie, prefixed to his works (3 vols. 1822).

Home Counties, the counties over and into which London has extended—Middlesex, Hertfordshire, Essex, Kent, Surrey. The south-eastern circuit (see ASSIZE) is still sometimes called the 'Home Circuit,' though it includes, besides the home counties (except Middlesex), also Cambridgeshire, Norfolk, and Suffolk.

Homelyn. See RAY.

Home Office. See SECRETARY OF STATE.

Homer. The poems of Homer differ from all other known poetry in this that they constitute in themselves an encyclopædia of life and knowledge; at a time when knowledge, indeed, such as lies beyond the bounds of actual experience was extremely limited, but when life was singularly fresh, vivid, and expansive. The only poems of Homer we possess are the *Iliad* and the *Odyssey*, for the Homeric *Hymns* and other productions lose all title to stand in line with these wonderful works, by reason of conflict in a multitude of particulars with the witness of the text, as well as of their poetical inferiority. They evidently belong to the period that follows the great migration into Asia Minor brought about by the Dorian conquest.

The *dictum* of Herodotus which places the date of Homer 400 years before his own, therefore in the 9th century B.C., was little better than mere conjecture. Common opinion has certainly presumed him to be posterior to the Dorian conquest. The Hymn to Apollo, however, which was the main prop of this opinion, is assuredly not his. In a work which attempts to turn recent discovery to account, I have contended that the fall of Troy cannot properly be brought lower than about 1250 B.C., and that Homer may probably have lived within fifty years of it (*Homeric Synchronism*, I. vi.).

The entire presentation of life and character in the two poems is distinct from, and manifestly anterior to, anything made known to us in Greece under and after that conquest. The study of Homer has been darkened and enfeebled by thrusting backwards into it a vast mass of matter, belonging to these later periods, and even to the Roman civilisation, which was different in spirit and which entirely lost sight of the true position of Greeks and Trojans, and inverted their moral as well as their martial relations. The name of Greeks is a Roman name: the people, to whom Homer has given immortal fame, are Achaians both in designation and in manners. The poet paints them at a time when the spirit of national life was rising within their borders. Its first efforts had been seen in the expeditions of Achaian natives to conquer the Asiatic or Egyptian immigrants who had under the name of Caduneians (etymologically, 'foreigners') founded Thebes in Bœotia, and in the voyage of the ship *Argo* to Colchis—which was probably the seat of a colony sprung from the Egyptian empire, and was therefore regarded as hostile in memory of the antecedent aggressions of that empire. The expedition against Troy was the beginning of the long chain of conflicts between Europe and Asia which end with the Turkish conquests, and with the reaction of the last 300 years, and especially of the 19th century, against them. It represents an effort truly enormous towards attaining nationality in idea and in practice. Clearing away obstructions, of which the cause has been partially indicated, we must next observe that the text of Homer was never studied by the moderns as a whole in a searching manner until within the last two generations. From the time of Wolf there

was infinite controversy about the works and the authorship with little positive result, except the establishment of the fact that they were not written but handed down by memory—an operation aided and methodised by the high position of bards as such in Greece (more properly Achaiis, and afterwards Hellas), by the formation of a separate school to hand down these particular songs, and by the great institution of the Games at a variety of points in the country. At these centres there were public recitations even before the poems were composed, and the uncertainties of individual memory were limited and corrected by competition carried on in presence of a people eminently endowed with the literary faculty, and by the vast national importance of handing down faithfully a record which was the chief authority touching the religion, history, political divisions, and manners of the country. Many diversities of text arose, but there was thus in continual operation a corrective as well as a disintegrating process.

The Germans, who had long been occupied in framing careful monographs which contracted the contents of the Homeric text on many particulars, such as the Ship, the House, and so forth, have at length supplied, in the work of Dr E. Buchholz, a full and methodical account of the contents of the text. This work would fill in English not less than six octavo volumes.

The Greeks called the poet *poiētēs*, the 'maker,' and never was there such a maker as Homer. The work, not exclusively but yet pre-eminently his, was the making of a language, a religion, and a nation. The last named of these was his dominant idea, and to it all his methods may be referred. Of the first he may have been little conscious while he wrought in his office as a bard, which was to give delight.

Careful observation of the text exhibits three powerful factors which contribute to the composition of the nation. First, the Pelasgic name is associated with the mass of the people, cultivators of the soil in the Greek peninsula and elsewhere, though not as their uniform designation, for in Crete (for example) they appear in conjunction with Achaians and Dorians, representatives of a higher stock, and with Eteocretans, who were probably anterior occupants. This Pelasgian name commands the sympathy of the poet and his laudatory epithets; but is nowhere used for the higher class or for the entire nation. The other factors take the command. The Achaians are properly the ruling class, and justify their station by their capacity. But there is a third factor also of great power. We know from the Egyptian monuments that Greece had been within the sway of that primitive empire, and that the Phœnicians were its maritime arm, as they were also the universal and apparently exclusive navigators of the Mediterranean. Whatever came oversea to the Achaian land came in connection with the Phœnician name, which was used by Homer in a manner analogous to the use of the word Frank in the Levant during modern times. But as Egyptian and Assyrian knowledge is gradually opened up to us we find by degrees that Phœnicia conveyed to Greece Egyptian and Assyrian elements together with her own.

The rich materials of the Greek civilisation can almost all be traced to this medium of conveyance from the East and South. Great families which stand in this association were founded in Greece and left their mark upon the country. It is probable that they may have exercised in the first instance a power delegated from Egypt, which they retained after her influence had passed away. Building, metal-working, navigation, ornamental arts, natural knowledge, all carry the Phœnician impress. This is the third of the great factors which were combined and evolved in the wonderful nationality of Greece, a power as vividly felt at this hour as it was three thousand years ago. But if Phœnicia conveyed the seed, the soil was Achaian, and on account of its richness that peninsula surpassed, in its developments of human nature and action, the southern and eastern growths. An Achaian civilisation was the result, full of freshness and power; in which usage had a great sacredness, religion was a moral spring of no mean force, slavery though it existed was not associated with cruelty, the worst extremes of sin had no place in the life of the people, liberty had an informal but very real place in public institutions, and manners reached to much refinement: while on the other hand fierce passion was not abated by conventional restraints, slaughter and bondage were the usual results of war, the idea of property was but very partially defined; and, though there were strong indeterminate sentiments of right, there is no word in Homer signifying law. Upon the whole, though a very imperfect, it was a wonderful and noble nursery of manhood.

It seems clear that this first civilisation of the peninsula was sadly devastated by the rude hands of the Dorian conquest. Institutions like those of Lycurgus could not have been grafted upon the Homeric manners; and centuries elapsed before there emerged from the political ruin a state of things favourable to refinement and to progress in the Greece of history; which, though in so many respects of an unequalled splendour, yet had a less firm hold than the Achaian time upon some of the highest social and moral ideas. For example, the position of women had greatly declined, liberty was perhaps less largely conceived, and the tie between religion and morality was more evidently sundered.

After this sketch of the national existence which Homer described, and to the consolidation of which he powerfully ministered, let us revert to the state in which he found and left the elements of a national religion. A close observation of the poems pretty clearly shows us that the three races which combined to form the nation had each of them their distinct religious traditions. It is also plain enough that with this diversity there had been antagonism. As sources illustrative of these propositions, which lie at the base of all true comprehension of the religion—which may be called Olympian from its central seat—I will point to the numerous signs of a system of Nature-worship as prevailing among the Pelasgian masses; to the alliance in the War between the Nature-powers and the Trojans as against the loftier Hellenic mythology; to the legend in *Iliad*, i. 396–412, of the great war in heaven, which symbolically describes the collision on earth between the ideas which were locally older and those beginning to surmount them; and, finally, to the traditions extraneous to the poems of competitions between different deities for the local allegiance of the people at different spots, such as Corinth, to which Phœnician influence had brought the Poseidon-worship before Homer's time, and Athens, which somewhat later became peculiarly the seat of mixed races. I have spoken of Nature-worship as the Pelasgian contribution to the composite Olympian religion. In the Phœnician share we find, as might be expected, both Assyrian and Egyptian elements. The best indication we possess of the Hellenic function is that given by the remarkable prayer of Achilles to Zeus in *Iliad*, xvi. 233–248. This prayer on the [illegible] of Patroclos is the hinge of the whole action of the poem, and is preceded by a long [illegible] (220–232) such as we nowhere else find. The [illegible] appears in it; and the immediate servants of Zeus [illegible]

several indications it may be gathered that the Hellenic system was less priestly than the Troic. It seems to have been an especial office of Homer to harmonise and combine these diverse elements, and his Thearchy is as remarkable a work of art as the terrestrial machinery of the poem. He has profoundly impressed upon it the human likeness often called anthropomorphic, and which supplied the basis of Greek art. He has repelled on all sides from his classical and central system the cult of nature and of animals; but it is probable that they kept their place in the local worships of the country. His Zeus is to a considerable extent a monarch, while Poseidon and several other deities bear evident marks of having had no superior at earlier epochs or in the countries of their origin. He arranges them partly as a family, partly as a commonwealth. The gods properly Olympian correspond with the Boulē or council upon earth; while the orders of less exalted spirits are only summoned on great occasions. He indicates twenty as the number of Olympian gods proper, following in this the Assyrian idea. But they were far from holding an equal place in his estimation. For a deity such as Aphroditē brought from the East, and intensely tainted with sensual passions, he indicates aversion and contempt. But for Apollo, whose cardinal idea is that of obedience to Zeus, and for Athēnē, who represents a profound working wisdom that never fails of its end, he has a deep reverence. He assorts and distributes religious traditions with reference to the great ends he had to pursue; carefully, for example, separating Apollo from the sun, with which he bears marks of having been in other systems identified. Of his other greater gods it may be said that the dominant idea is in Zeus policy, in Hērē nationality, and in Poseidon physical force. His Trinity, which is conventional, and his Under-world appear to be borrowed from Assyria, and in some degree from Egypt. One licentious legend appears in Olympos, but this belongs to the *Odyssey*, and to a Phœnician, not a Hellenic circle of ideas. His Olympian assembly is, indeed, largely representative of human appetites, tastes, and passions; but in the government of the world it works as a body on behalf of justice, and the suppliant and the stranger are peculiarly objects of the care of Zeus. Accordingly we find that the cause which is to triumph in the Trojan war is the just cause: that in the *Odyssey* the hero is led through suffering to peace and prosperity, and that the terrible retribution he inflicts has been merited by crime. At various points of the system we trace the higher traditions of religion, and on passing down to the classical period we find that the course of the mythology has been a downward course.

The Troic as compared with the Achaian manners are to a great extent what we should now call Asiatic as distinguished from European. Of the great chieftains, Achilles, Diomed, Ajax, Menelaos, and Patroclos appear chiefly to exhibit the Achaian ideal of humanity; Achilles especially, and on a colossal scale. Odysseus, the many-sided man, has a strong Phœnician tinge, though the dominant colour continues to be Greek. And in his house we find exhibited one of the noblest among the characteristics of the poems in the sanctity and perpetuity of marriage. Indeed, the purity and loyalty of Penelope are, like the humility approaching to penitence of Helen, quite unmatched in antiquity.

The plot of the *Iliad* has been the subject of much criticism on account of the long absence of Achilles, the hero, from the action of the poem. But Homer had to bring out Achaian character in its various forms, and while the vastness of Achilles is on the stage every other Achaian hero must be eclipsed. Further, Homer was an itinerating minstrel, who had to adapt himself to the sympathies and traditions of the different portions of the country. Peloponnesos was the seat of power, and its chiefs acquired a prominent position in the *Iliad* by what on these grounds we may deem a skilful arrangement. But most skilful of all is the fine adjustment of the balance as between Greek and Trojan warriors. It will be found on close inspection of details that the Achaian chieftains have in truth a vast military superiority; yet by the use of infinite art Homer has contrived that the Trojans shall play the part of serious and considerable antagonists, so far that with divine aid and connivance they reduce the foe to the point at which the intervention of Achilles becomes necessary for their deliverance, and his supremacy as an exhibition of colossal manhood is thoroughly maintained.

The plot of the *Odyssey* is admitted to be consecutive and regular in structure. There are certain differences in the mythology which have been made a ground for supposing a separate authorship. But, in the first place, this would do nothing to explain them; in the second, they find their natural explanation in observing that the scene of the wanderings is laid in other lands, beyond the circle of Achaian knowledge and tradition, and that Homer modifies his scheme to meet the ethnical variations as he gathered them from the trading navigators of Phœnicia, who alone could have supplied him with the information required for his purpose.

That information was probably coloured more or less by ignorance and by fraud. But we can trace in it the sketch of an imaginary voyage to the northern regions of Europe, and it has some remarkable features of internal evidence supported by the facts, and thus pointing to its genuineness. In latitudes not described as separate we have reports of the solar day apparently contradictory. In one case there is hardly any night, so that the shepherd might earn double wages. In the other, cloud and darkness almost shut out the day. But we now know both of these statements to have a basis of solid truth on the Norwegian coast to the northward, at the different seasons of the midnight sun in summer, and of Christmas, when it is not easy to read at noon.

The value of Homer as a recorder of antiquity, as opening a large and distinct chapter of primitive knowledge, is only now coming by degrees into view, as the text is more carefully examined and its parts compared, and as other branches of ancient study are developed, especially as in Assyria and Egypt, and by the remarkable discoveries of Dr Schliemann at Hissarlik and in Greece. But the appreciation of him as a poet has never failed, though it is disappointing to find that a man so great as Aristophanes should describe him simply as the bard of battles, and sad to think that in many of the Christian centuries his works should have slumbered without notice in hidden repositories. His place among the greatest poets of the world, whom no one supposes to be more than three or four in number, has never been questioned. Considering him as anterior to all literary aids and training, he is the most remarkable phenomenon among them all. It may be well to specify some of the points that are peculiarly his own. One of them is the great simplicity of the structure of his mind. With an incomparable eye for the world around him in all things great and small, he is abhorrent of everything speculative and abstract, and what may be called philosophies have no place in his works, almost the solitary exception being that he employs thought as an illustration of the rapidity of the journey of a deity. He is, accordingly, of all poets the most simple and direct. He is also the most free and genial in the movement of

his verse: grateful nature seems to give to him spontaneously the perfection to which great men like Virgil and Milton had to attain only by effort intense and sustained. In the high office of drawing human character in its multitude of forms and colours he seems to have no serious rival except Shakespeare. We call him an epic poet, but he is instinct from beginning to end with the spirit of the drama, while we find in him the seeds and rudiments even of its form. His function as a reciting minstrel greatly aided him herein. Again, he had in his language an instrument unrivalled for its facility, suppleness, and versatility, for the large range of what would in music be called its register, so that it embraced every form and degree of human thought, feeling, and emotion, and clothed them all, from the lowest to the loftiest, from the slightest to the most intense and concentrated, in the dress of exactly appropriate style and language. His metre also is a perfect vehicle of the language. If we think the range of his knowledge limited, yet it was all that his country and his age possessed, and it was very greatly more than has been supposed by readers that dwelt only on the surface. So long as the lamp of civilisation shall not have ceased to burn, the *Iliad* and the *Odyssey* must hold their forward place among the brightest treasures of our race.

It is impossible to give any satisfactory account of the Homeric bibliography, not only from its extent, but from the fragmentary manner in which for the most part the subject has been handled, and through the rapid extension of the field by the importation of new knowledge from sources apparently remote, which brings with it new lights. The works of Blackwell and Wood, the latter of which attained to celebrity, will show how slender was the *apparatus criticus* of their time. Thirlwall, Grote, and Mitford, who is now antiquated, contain good ideas, but Grote condemns as pure myth or fable much that is now gradually taking historic form, and vivisects the *Iliad* by resolving it into an Achilleis and an Ilias. The first English writers who indicated a study of the text at once comprehensive and appreciative were Keble in his *Prælectiones Poeticæ*, and Colonel Mure in his *History of the Literature of Greece*. Mr Robert Brown's *Poseidon* is a good example of method in tracing the origin of the Olympian deities. Nägelsbach rendered an essential service by dividing for the first time the *Homerische* from the *Nachhomerische Theologie*. Mure first, I think, taught the need of large and careful collection of matter from the text; and this process has been carried to its consummation by Dr Buchholz of Berlin, whose collection of the *realien* or contents of the poems must have been the work of at least twenty years. This, however, is a meagre notice of a literature which might of itself form the study of a life.

EDITIONS: Dindorf; Nauck; Bekker; La Roche; Ameis; Monro (*Iliad*); Paley (*Iliad*); Leaf (*Iliad*); Merry (*Odyssey*); Hayman (*Odyssey*). DIALECTS, GRAMMARS, DICTIONARIES, CONCORDANCES, &c.: Delbruck's *Syntactische Forschungen*; Monro's *Homeric Grammar*; Döderlein's, Autenrieth's, and Ebeling's Dictionaries; Liddell and Scott, capital for Homer though not Homeric *ex professo*; Prendergast's *Concordance to the Iliad*; Dunbar's *Concordance to the Odyssey and the Hymns*; Seberus, *Index Homericus*. HELP-BOOKS: Nagelsbach's *Homerische Theologie*; Gladstone's *Studies on Homer*, *Primer*, and other Homeric works; Jebb's *Introduction to Homer*. Matthew Arnold's *Lectures on Translation of Homer*. TRANSLATIONS INTO ENGLISH: *Iliad* (verse)—Chapman, Pope, Cowper, Lord Derby, Blackie, Worsley and Conington, Way, Wright, Green; *Iliad* (prose) Leaf, with Myers and Lang; *Odyssey* (verse)—Pope, Chapman, William Morris, Worsley, Lord Carnarvon, Way, Schomberg, 'Avia;' *Odyssey* (prose)—Butcher and Lang. For information on various matters connected with Homer and the Homeric poems, see the articles in this work on ACHILLES, HELEN, TROY, ULYSSES, &c.; also GREECE, Vol. V. p. 390.

Home Rule. See IRELAND.

Homestead. By the Homestead Act of 1862 every citizen of the United States, native or naturalised, who has reached the age of twenty one years, or is the head of a family, is entitled to claim one-quarter section (160 acres) of any of the public lands that are surveyed and otherwise unappropriated. The sole condition attaching to what is virtually a gift from the government to the settler is five years' residence upon the property, something of course being done to improve it. A title is then granted by the general land office in Washington. Except in the case of non-payment of the moderate registration and other fees, the homestead is absolutely exempt from forced sale for debt; the object of this provision being to guard the interests of women and children. See PRE-EMPTION.

Homestead, on the Monongahela River, in Pennsylvania, 8 miles SE. of Pittsburgh by rail, is the main seat of the great iron and steel works of the Carnegie Company, employing 40,000 men. The labour riots of 1892 amounted almost to civil war. Pop. of the 'post-village' (1880) 592; (1890) 7911.

Homicide. See JUSTIFIABLE HOMICIDE, MANSLAUGHTER, MURDER, INSANITY.

Homildon Hill, a battlefield in Northumberland, 1 mile NE. of Wooler. In 1402 Earl Douglas at the head of 10,000 Scots had ravaged England as far as Newcastle, and was returning laden with booty, when on 14th September he was intercepted by an English army under Hotspur and the exiled Earl of March and Dunbar, so posted himself upon Homildon (Humbleton) Hill. Hotspur was eager for a headlong charge, but, by March's advice, the bowmen were set to play upon the Scots, who 'stood long like deer in a park to be butchered,' and, too late descending to come to close quarters, sustained an irretrievable defeat. Douglas himself was wounded in five places, and was taken prisoner, with four other earls, two barons, and eighty knights. See HENRY IV.

Homily (Gr. *homilia*) primarily signifies a discourse held with one or more individuals, but in ecclesiastical use it means a discourse held in the church. The practice of explaining in a popular form the lessons of Scripture read in the synagogues had prevailed among the Jews, and appears to have been adopted in the Christian churches from the earliest times; but we have no sample of this form of composition earlier than the homilies of Origen in the 3d century. The early Christian homily may be described as a popular exposition of a portion of Scripture, accompanied by moral reflections and exhortations. It differs from the sermon (Gr. *logos*, Lat. *oratio*) in following the order of the scriptural text or narrative, instead of being thrown into the form of a rhetorical discourse or a didactic essay. The name homily is, however, very frequently used almost as a synonym for sermon; and *Homiletics* is that branch of theology which deals with the rules for composing sermons and discourses of any kind, sometimes called 'sacred rhetoric.' Ancient collections of homilies or *homiliaria* are very numerous; the most notable being that compiled about 782 by Paulus Diaconus, under Charlemagne's authority.

The Homilies of the Church of England are a collection of sermons, the first part of which was published in 1547, the first year of the reign of Edward VI., to be read in the churches, partly in order to supply the defect of sermons, but partly, also, to secure uniformity of doctrine, and to guard against the heterodoxies, old and new, which at that time threatened the unconsolidated church. The second part was published in 1562, at the same time with the Articles, under Elizabeth. The 35th Article declares that 'the Book of Homilies doth contain a godly and wholesome doctrine, and necessary for these times.' The titles are enumerated in the article, and are twenty-one in number. The

homilies are not now read in churches, but there is no law to prevent their being so read, and they are frequently appealed to in controversies as to the doctrine of the Anglican Church on the points of which they treat. The precise degree of authority due to them is matter of doubt.

Hominy, a preparation of maize, coarsely ground and boiled, a kind of [illegible] porridge.

Homocercal. See Heterocercal.

Homœopathy (*homoion*, 'like;' *pathos*, 'disease'), a medical doctrine, which teaches that diseases should be treated or cured by drugs capable of producing in healthy persons symptoms of disordered health to those presented by them; or, as it is commonly phrased, 'likes should be treated by likes,' or let likes be cured by likes (*similia similibus curentur*).

The earliest mention of this doctrine occurs in one of the books attributed to Hippocrates, who taught that some diseases were cured by similars and some by contraries. He illustrated the former by pointing to mandrake as a cure for mania; 'give the patient,' he says, 'a draught made from the root of mandrake in a smaller dose than is sufficient to produce mania.' Reference is also made to the doctrine of similars by several medical authors during the centuries that followed. In 1738 Stahl, a Danish army surgeon, wrote that 'the rule generally acted upon in medicine to treat by means of oppositely acting remedies is quite false, and the reverse of what ought to be; I am, on the contrary, convinced that diseases will yield to and be cured by remedies that produce a similar affection.' The celebrated Von Stöerck, in 1762, urged the same rule as a reason for using stramonium in insanity. Though impressed with the importance of this doctrine, these writers took no steps towards rendering it available in the practice of medicine. To do this was reserved for Samuel Hahnemann (q.v.), who, in 1796, in an essay entitled 'Suggestions for ascertaining the Curative Powers of Drugs,' published in *Hufeland's Journal*, then the leading medical periodical of Europe, showed, as the result of a series of researches and experiments extending over six years, that in this doctrine lay the key to the selection of specifically acting medicines; of medicines, that is, which cure by exercising a direct influence upon the parts diseased, as distinguished from those which relieve by what is termed their 'derivative' action. For example, it was then, and is now, customary to endeavour to control congestion of the brain by purgatives, by medicines operating not on the brain but upon the bowels. Hahnemann, on the other hand, asserted that congestion of the brain was most quickly and certainly cured by prescribing small doses of a medicine which previous experiment had proved to have a special influence upon the circulation in that organ—a direct method. The nature of this influence, he further showed, must be one of *similarity*. This similarity was, he pointed out, recognised by the symptoms indicating the nature of the disease-process on the one hand, and those marking the action of the drug when taken by persons in ordinary health on the other.

This doctrine, then, applies solely to that part of the treatment of disease which relates to the use of medicines; and further, it is restricted to prescribing medicines in diseases which are not dependent for their existence on some mechanical cause, such as the presence of a mass of undigested food in the stomach, or of a stone in the bladder. To those parts of treatment which are concerned with nursing, dietetics, hygiene, the use of water in various ways, electricity, massage, &c., homœopathy, as such, bears no reference; though those physicians who have adopted it attach great importance to these therapeutic measures. Homœopathy has solely to do with the selection of drugs when these are needed for directly curative purposes—a sufficiently wide range truly! Hahnemann's claims to distinction as a therapeutist rest not merely on his having recognised this doctrine as a rule of drug selection in a wide range of diseases—this had been done to some extent by others, as he himself has admitted—but upon his having rendered it possible to apply it in practice; as he wrote in 1810, 'no one has as yet *taught* this homœopathic therapeutic doctrine.' If it were true that the symptoms evoked by a drug should regulate its employment in disease, the symptoms which drugs will cause must needs be ascertained. Hence the study of drugs by making experiments with them upon healthy persons—drug-proving, as it is termed—became a cardinal point in the teaching of Hahnemann. It forms, indeed, the *first* maxim of homœopathy.

Further, if a medicine is to be used that will produce a condition like that which it is intended to cure, it is obvious that it must be prescribed in a dose smaller than that in which it is capable of producing such a condition. This much was clear to Hahnemann when he first applied homœopathy at the bedside. During the first three or four years of his doing so he used doses of from three to four grains of such medicines as nux vomica and veratrum powder; of arnica powder he gave 'a few grains;' of ignatia, from three to seven grains, and so on. As his experience in the use of medicines upon this basis increased he found that far more minute doses than these were all-sufficient, and in 1806 he writes of his giving hundredths, thousandths, and millionths of the quantities required to obtain the antipathic or allopathic action of a drug. In graduating his doses Hahnemann followed where his experience seemed to lead him, his one desire apparently being to give no more medicine than was absolutely necessary for the cure of disease.

What is the safest, surest, and best dose in which to prescribe a homœopathically chosen medicine is a question upon which there is a great difference of opinion among those who have studied the subject. The only principles upon which there is any unanimity among them are that the dose to cure must be smaller than that which will produce a condition like that to be treated, and that different persons are susceptible to the influence of widely differing doses. The necessity for the dose being a small one is the *second* maxim of homœopathy. The *third* is that medicines must be prescribed in the form in which they were taken when 'proved'—i.e. when the experiments were made which revealed the kind of action they have upon healthy persons. This is essential, because, however well acquainted such experiments may render the physician with medicines individually, they teach him nothing of what the action of such medicines will be when combined with one or more others. He has no means of ascertaining what would be the influence exercised upon the action of his 'base' by the 'corrective' or the 'adjuvant' of the ordinary prescription combination of drugs.

To account for or explain the *modus operandi* of a homœopathically selected medicine several theories have been advanced. Hahnemann put forward one which, however, he at the same time declared that he regarded as of no importance. So far no explanation hitherto attempted has met with any general acceptance from those who admit the truth of the doctrine. It is as an ultimate fact in therapeutics, the reality and value of which can only be ascertained by putting it into practice at the bedside, that homœopathy has always been regarded, rather than as a speculative idea to be

demonstrated or refuted by theoretical discussions or *a priori* arguments. Hence it is to the results of experience in employing homœopathically selected medicines, especially in epidemics notoriously attended by a great mortality under the usual methods of treatment, that those who advocate this method appeal to sustain their position.

For example, in 1836 cholera was devastating Austria, when a petition was presented to the government to allow homœopathy to be tested. Dr Fleischmann was accordingly ordered to fit up a hospital in the Gumpendorf suburb of Vienna for the reception of cholera patients to be treated homœopathically. The result showed that whereas 70 per cent. of those treated in the ordinary way died, Dr Fleischmann lost only 33 per cent.

Again, in yellow fever, in 1878 the American Institute of Homœopathy appointed a commission, consisting of physicians who had had experience in dealing with this disease, to ascertain the number of cases treated homœopathically during the epidemic of that year, and the rate of mortality amongst them. The report showed that in and around New Orleans 3914 cases were treated, with a loss of 261, being a mortality of only 6·6 per cent. in this singularly fatal form of disease.

Lastly, in the city of Melbourne typhoid fever recurs in epidemic form every year. The *Melbourne Herald* of April 20, 1889, gave the following hospital statistics of typhoid for three seasons. During these three epidemics the Melbourne hospital, with 318 beds, received 1182 cases of typhoid, of which 181, or 15·31 per cent., died. The Alfred Hospital, with 144 beds, admitted 998 cases; of these 135, or 13·52 per cent., were fatal. The Homœopathic Hospital, with 60 beds, received 554 cases, of which 49, or 8·84 per cent., died.

Another argument in support of the contention that homœopathy affords a real basis on which to select a medicine is drawn from the fact that Hahnemann, when appealed to in 1832 to suggest the medicines most likely to be useful in cholera, without ever having seen a case, but merely from studying the symptoms of some that were reported to him, and comparing these symptoms with those produced by medicines he had experimented with, named camphor, copper, and white hellebore as the remedies; and these, with the single addition of arsenic, have since been found to be more serviceable in checking the disease than any others. It is consequently urged that for a principle of drug-selection to enable the physician to indicate beforehand the appropriate remedy in an entirely new form of disease is a strong proof of its truth, and evidence of its value.

Finally, homœopathists contend that the unacknowledged adoption of many of the practical results of their teaching by physicians who professedly repudiate homœopathy is an additional proof that this teaching is sound. The text-books on Materia Medica which are now most popular in the medical schools, the *Handbook of Therapeutics*, by Dr Sidney Ringer, and Dr Lauder Brunton's *Materia Medica, Pharmacology, and Therapeutics*, abound with recommendations for the use of medicines in diseases in which they were first known to be of service through homœopathy. Of these, the use of aconite in inflammatory fever is one of the most conspicuous. That it would be found capable of reducing the fever with which acute inflammations are usually ushered in was an inference drawn by Hahnemann from the experiments that he had made with it; and, when publishing his conclusion, he foretold that it would entirely supersede the necessity for blood-letting, then so constantly employed in such cases. It was the endorsement of this statement by Dr Uwins—who had to some extent tested the worth of homœopathically selected medicines—at a meeting of the London Medical Society in 1836 that so shocked the members present as to induce them to pass a resolution precluding all reference to homœopathy at any future meeting. To use aconite in small doses in acute inflammatory fever is thoroughly homœopathic, and is at the same time a very common practice now among those who deny that homœopathy is of any value to the physician. Many other medicines there are that are very generally used by opponents of homœopathy in conditions to which they are homœopathic, and in which they were originally made known to be useful by those who practise homœopathically; such, for example, as arsenic in gastric irritation, ipecacuanha in vomiting, corrosive sublimate in dysentery, belladonna in quinsy, &c.

While homœopathists accept these appropriations as so many tributes to the truth of their doctrine, and look upon them as important advances in therapeutics, at the same time, in the absence of any knowledge on the part of those who use them of the doctrine which led to their employment, they regard them as calculated to give rise to disappointment in some instances. They do so for the reason that all cases of a given form of disease are not so precisely similar as to admit of cure by the same medicine. Thus, to give belladonna in all quinsies, while of advantage in many, would be useless in some, because all cases of quinsy do not resemble that produced by belladonna. Some are more like that occasioned by mercury, others that of the poison of the honey-bee, or of one of the serpent poisons, others that of the *Phytolacca decandra*, and so on; and it is, the homœopathist argues, only when the doctrine of homœopathy is strictly adhered to in each *individual instance* of a disease that that success which he contends will follow his method can be looked for.

From the date of the publication of Hahnemann's first essay on Homœopathy the opposition this doctrine has met with from the great majority of the profession in Great Britain has been of the most determined and persistent character. Of late years the intensity of the bitterness of feeling which this controversy aroused has been somewhat mitigated, or perhaps the influence of public opinion has prevented its indulgence to the same extent as formerly. The last attempt to deprive a physician of his hospital appointment on the ground that he was treating his patients homœopathically failed, while several open adherents of this doctrine are to be found holding public health and poor-law appointments. The number of those who in Great Britain admit that they practise homœopathy has never at any one time exceeded 300. The chief hospital where homœopathy is practised is the London Homœopathic (1850), with ninety beds and a large out-patient department. There are similar institutions at Birmingham, Liverpool, Bath, Plymouth, Bournemouth, Eastbourne, and Bromley; and a convalescent home in connection with the London Hospital has recently been opened at Eastbourne. In addition to these there are about a hundred homœopathic dispensaries in different parts of the country.

In the United States of America, where public opinion is more powerful than professional feeling, homœopathy has spread rapidly and widely, and it is estimated that nearly one-fourth of the qualified practitioners of medicine in that country have adopted it. There are over fifty hospitals and nearly as many dispensaries; and the journals devoted to homœopathy exceed a score in number. It is taught in thirteen medical colleges and in three of the universities. In Europe there is only one university where there is a chair of Homœopathy viz. at Budapest.

Though Hahnemann is denounced by many as a 'fanatic and a 'knave,' and notwithstanding that homœopathy has very generally been set aside as a 'fraud,' no one can study the history of medicine during the 19th century without perceiving the powerful influence it has had on the general practice of the medical profession. While, during the last fifty years of the century, homœopathy was gradually becoming more frequently practised, the weapons commonly used against disease were of the most formidable character. Bleeding by lancet, leeches, and cupping glasses, mercurialism, purgatives, &c. were in constant use. The progress of homœopathy in Austria, and the assumption on the part of some physicians that it was a purely negative mode of treatment, the success of which was due to the omission of all drugs, led to that scepticism in medicine which, originating with Skoda in Vienna, prevailed throughout the profession during the next twenty years. 'Placebos' took the place of the lancet, bread-pills formed a substitute for purgatives, and 'ptisans' did duty for mercury. As the literature of homœopathy increased a revival of interest in the use of drugs followed; and during the last twenty years the method of studying the actions of drugs originally suggested and carried out by Hahnemann has been adopted to a very large extent, under the designation of pharmacology; while, for practical purposes, the uses of drugs proposed by homœopathists, and set forth in their journals and published works, have, as has already been stated, been very largely followed. See the article MEDICINE.

The chief authorities on homœopathy are: *The History of Homœopathy—its Origin and Conflicts*, by Dr Amcke, translated by Dr A. E. Drysdale; *Lectures on Homœopathy*, by Dr Dudgeon; *Homœopathy—its Principle, Method, and Future*, by Dr Pope; *Fifty Reasons for being a Homœopath*, by Dr Burnett; *A Manual of Therapeutics*, by Dr Hughes; *A Manual of Pharmacodynamics*, by Dr Hughes. *The Homœopathic Review* and *The Homœopathic World* are published monthly.

Homology. See ANALOGY, and DARWINIAN THEORY, Vol. III. p. 689.

Homoousian (Gr. *homos*, 'the same,' and *ousia*, 'substance') and HOMOIOUSIAN (Gr. *homoios*, 'like,' and *ousia*, 'substance'), two terms that long distracted the primitive church in connection with the Arian and semi-Arian controversies. See ARIUS, CREEDS.

Homoptera (Gr. *homos*, 'the same, uniform;' *pteron*, 'a wing'), a division of the insect order Hemiptera (q.v.), including Coccus insects, Aphides, Cicadas, &c. (q.v.).

Homotaxis. See CONTEMPORANEITY.

Homs. See HEMS.

Honan, one of the central provinces of China, desolated in 1887 by the inundation of the Hoang ho. See CHINA, HOANG-HO.

Honawar, a small seaport on the Malabar or west coast of India, is a town in the district of North Kanara, in the presidency of Bombay, and is 340 miles SSE. of Bombay. Pop. 6658.

Honduras, a Central American republic, since 1895 confederated with Nicaragua and Salvador as part of the República Mayor de Centro-América, lies between Nicaragua and San Salvador and Guatemala, and is bounded on the N. and NE. by the Bay of Honduras and the Caribbean Sea, having here a coast-line of some 400 miles; while on the S. the Bay of Fonseca, over 50 miles long and about 30 wide, opens to the Pacific. The area of Honduras is calculated at 46,500 sq. m.; the pop. is stated at 435,000. Except for a narrow strip of swamp-land along either coast, the country is a tableland, its series of elevated plateaus broken by broad and fertile plains and valleys, or rising to mountain-ridges that reach 8000 feet (highest peak, the Montaña de Selaque, 10,120 feet). There are no active volcanoes. The Cordilleras proper traverse the country irregularly in a north-west and south-east direction. Honduras is watered by innumerable streams, though these are seldom navigable, and then only for short distances; the Wanks or Segovia, which forms for many miles the boundary with Nicaragua, has a length of 350 miles. Roatan and the other fertile Bay Islands (q.v.), off the north coast, belong to Honduras, as well as two small islands in the Bay of Fonseca. The climate is hot on the coast, where also fever prevails; but in the highlands the temperature is low, and in the principal towns the mean is 74° F. In the mountains heavy frosts encrust the leaves of the pine and oak forests in November and December; but snow has never been known. Generally speaking, the rainy season extends from May to November. The flora and fauna are very nearly the same as those of Guatemala (q.v.); but in Honduras the raising of cattle is an important industry, while agriculture receives no such attention as in Guatemala. In minerals Honduras is the richest of the Central American republics. Silver ores in almost every variety are abundant; gold is washed principally in Olancho, and mined in one or two places; rich iron ores are found, mostly magnetic; also copper, antimony, platinum, zinc, and tin. There are beds of lignite in Gracias department, and famous opals that are second only to those of Hungary. The mineral resources have never been properly developed, but now that several North American and other foreign companies are at work, and especially since a waggon-road has been constructed from the Pacific coast to Yuscaran (122 miles), by which heavy machinery can be conveyed into the heart of the silver belt, there is every prospect of scientific methods being successfully applied. The exports in 1895, mostly to the United States, and consisting chiefly of cattle, fruits and cocoa-nuts, india-rubber, sarsaparilla, timber, and indigo, exceeded 1,800,000 dollars. The imports may be estimated at 1,500,000 dollars.

The republic is divided into thirteen departments. Under the revised constitution of 1894 (after the successful revolution of that year), the president is elected for four years, and is assisted by six ministers; and the legislative power is vested in a congress of thirty-seven deputies. The president, however, is for all practical purposes a dictator. The active army consists of 500 men, the militia of 3000. The finances of the country are extremely embarrassed, partly owing to wars with the two neighbouring states in 1872–76; while three loans contracted on heavy terms in London and Paris in 1867–70, for the purpose of making an interoceanic railway, have left Honduras saddled with a foreign debt of £5,398,570, exclusive of the interest, which has been accumulating since 1872; and for this there is only a line from Puerto Cortez to San Pedro Sula (38 miles) to show. The internal debt is returned at 2,745,000 dollars. The revenue for the year 1895 was put at 1,550,000 dollars, the expenditure at 1,543,000 dollars.

Honduras was discovered by Columbus on his fourth voyage, in 1502, and derives its name from the Spanish *honduras*, 'depths,' in allusion, according to the common account, to the difficulty he experienced in finding anchorage on its coast. There are numerous pyramids and other remains of the ancient inhabitants. Honduras threw off the yoke of Spain, with the rest of Central America, in 1821, and became independent on the dissolution of the confederation in 1839. Revolutions and frequent wars with Guatemala and San Salvador ended only in 1876, since when a considerable

improvement is visible. Education is nominally compulsory, and there are primitive state-schools in the towns and large villages, besides a college in Tegucigalpa and Comayagua. The whites are very few in number, the Indians, negroes, and mixed races including all but some 6000 or 7000 of the population. On the Mosquito coast there is a considerable population of so-called 'Caribs' (q.v.). There are no towns of any importance, the largest being the capital, Tegucigalpa, with 12,000 inhabitants. The ports are Amapala, on the Bay of Fonseca, Puerto Cortez or Puerto Caballos, Omoa, and Truxillo. There were fifty-six post-offices in 1890 and 1800 miles of telegraphs, both maintained at a considerable loss; and, besides a continuation of the interoceanic railway, a line is projected between Puerto Cortez and Truxillo, through a rich fruit district.

See Stephens, *Incidents of Travel in Central America* (New York, 1841); Squier, *Notes on Central America* (New York, 1855), and *Honduras* (Lond. 1870); Wells, *Explorations and Adventures in Honduras* (New York, 1857); 'Soltera,' *A Lady's Ride across Spanish Honduras* (Lond. 1884); and Lombard, *The New Honduras* (New York, 1887).

Honduras, British. See Belize.

Hone, William, a versatile and industrious English writer, was born at Bath, June 3, 1780. He had but little education, and, after some years of hopeless drudgery in London as a lawyer's clerk, at twenty started a book and print shop there. But his busy mind was too full of all kinds of extraneous projects for success in business; and after no long time savings-bank schemes and lunatic asylum inquiries brought him to bankruptcy. He struggled bravely to get bread for his already numerous family by writing to various papers, started the *Traveller*, and next the *Reformist's Register* (February 1–October 25, 1817), which quickly carried his name across England by its brilliant political squibs and parodies, and by the caricatures of Cruikshank. On the 18th, 19th, and 20th December 1817 he was subjected to three separate trials before special juries for publishing things calculated to injure public morals and bring the Prayer-book into contempt. The prosecution was of course really political rather than religious, and the strongest pressure was brought to bear upon the court, yet Hone was acquitted on all three counts, after defending himself, weak in health as he was, with remarkable vigour and ability for over six hours each day. Among the more successful of his later satires, all illustrated by Cruikshank, were *The Political House that Jack built*, *The Queen's Matrimonial Ladder* (for Queen Caroline), *The Man in the Moon*, and *The Political Showman*. Works that revealed much reading in obscure channels were the *Apocryphal New Testament* (1820) and *Ancient Mysteries Explained* (1823). The *Every-day Book* (1826), *Table-book* (1827–28), and *Year-book* (1829) contained rich stores of information on manners and antiquities, into which most later miscellaneous writers upon folklore and popular traditions have burrowed. Yet their stout-hearted compiler at the end found himself in a debtor's jail, from which his friends extricated him to start him in a coffee-house—also a failure. In 1830 Hone edited Strutt's *Sports and Pastimes*, and contributed later to the *Penny Magazine* and the *Patriot*. In his last years he swung back to the devout theology of his mother's hearth, and often preached on Sundays. He died at Tottenham, 6th November 1842.

Hones. See Whetstones.

Honesty (*Lunaria*), a genus of plants of the natural order Cruciferæ, of which two species, natives of the south of Europe, *L. annua* or *biennis* and *L. rediviva*, have long been cultivated in British flower-gardens, on account partly of the beauty of their flowers, and partly of the curious appearance of their large flat seed-pouches (silicules), or rather their large oval membranous dissepiments, which are very persistent, resemble polished films of mother-of-pearl, and are frequently used as mantelpiece and table ornaments.

Honesty (*Lunaria biennis*) in seed.

The origin of the English name is doubtful. Some of the older English poets mention the plant as *Lunarie*—'in sorceries excelling;' for it was reckoned among herbs potent for magic.

Honey is a sweet, thick liquid produced by bees and other insects of the same genus. The working bees gather the nectar from the nectaries of flowers, and also sweets from other sources when nectar is scarce, which they carry home to the hive in the crop or honey-bag. Here it appears to undergo a transformation, by which it becomes honey before it is disgorged into the cells of the comb. Yet the change is such that many of the distinctive characteristics of the various materials can be traced in the manufactured honey. Thus we find clover and heather honey easily distinguishable, the clover-honey being a clear white—almost greenish-white—fluid liquid; while that obtained from the heather has a rich amber colour, and is much more viscid, so that it cannot be slung from the combs without destroying them. The flavour and colour of other flowers can also be distinctly traced in various honeys, such as that made from the flowers of the ivy and that from honey-dew, the produce of the Aphides, which may be seen in summer in the form of a sticky liquid on the leaves of the lime and other trees. In default of better food bees sometimes resort to this honey-dew. But it imparts a blackish hue to the honey and a disagreeable flavour.

Honey contains dextro-glucose and lævo-glucose, cane-sugar, as also gummy, waxy, colouring matter, and essential odorous oils, along with water and a minute quantity of mineral matter and pollen. The proportion of crystallisable sugar increases with the age of the honey, so that in time it acquires a granular consistency. Exposure to light and cold increases this tendency, which is stronger in some kinds of pure honey than in others.

As an article of commerce and for human consumption honey is presented both in the comb and as run honey. The run honey is separated from the wax of which the storing cells are composed,

by the centrifugal extractor, or by the more tedious and less perfect method of cutting the comb in pieces and running the honey through a bag placed near a fire. The best form of comb honey is that which is termed virgin honey. It is contained in pure white cells of very thin wax. These cells have never been used by the bees for any other purpose than the storage of honey. When the cells have been previously used for the incubation of eggs and the development of bees through the larva stage they become discoloured and much thicker in the walls, and after repeated use in breeding they become quite black. Comb honey in dark-coloured cells is of very inferior quality.

From the remotest times honey has been employed as an article of food. And to the ancients, who were unacquainted with sugar, it was of more importance than it now is. 'A land flowing with milk and honey' offered the highest conceivable advantages to the eastern mind. The honey of Hymettus, a mountain in Attica, and of Hybla, a mountain in Sicily, were of old held in high repute, doubtless in consequence of the wild thyme and other fragrant herbs growing upon them. The honeys of Narbonne and of Chamonix for similar reasons are now held in high estimation, as also the heather-honey of Scotland. Taken in moderate quantity, honey is nutritive and mildly laxative. Some few kinds possess poisonous properties, such as that of the Brazilian wasp and the honey of Trebizond gathered from the *Azalea pontica*. Much adulterated honey is sold; see ADULTERATION.

As a demulcent and flavouring agent honey is used in many preparations of medicine. It is also used in the preparation of several popular sweetmeats and in the manufacture of some kinds of ale. Mead is a fermented liquor made from the washings of the combs from which honey has been extracted. Large quantities of honey are annually imported into Great Britain from America, especially from California, where many large bee-farms exist. See BEE; and for the Honey Ant, see ANT.

Honey-buzzard, or BEE KITE (*Pernis apivorus*), one of the Falconidæ, allied to both kites and buzzards, but with many peculiarities, such as the thick feathering of the sides of the head down to the base of the bill. It winters in Africa, and breeds in the wooded districts of north Europe, ranging, however, as far east as China and Japan. To Britain it is usually only a visitor, and that not very commonly; but there are records of its occasional breeding here. Howard Saunders tells how collectors of 'British' specimens paid £5 for a couple of eggs, or £40 for a pair of old birds, till the breeding virtually ceased. The honey-buzzard owes its name to its habit of plundering the nests of bees and wasps for the sake of the larvæ, and apparently also the honey. It also devours grubs of many kinds and various small animals. The nest, often founded on that of some other kite, is situated on some leafy tree, and may be further concealed by a covering of leaves, which are replaced as they wither. The eggs, usually two, are laid in June, which is late for a bird of prey. The genus includes a few other species.

Honeycomb Moth, or BEE MOTH (*Galleria*), a genus of small moths in the same family as the Grass moths (Crambus), and noteworthy for the habit some of the species have of infesting beehives. There they deposit their eggs; and the larvæ feed on the honeycomb, through which they make tunnels lined with silk. In a corner of the hive the cocoons are spun, and the metamorphoses accomplished. There are two broods in the year, and the later pupæ sleep through the winter. The best-known species, *G. mellonella*, is a satiny moth, about an inch across the wings. When they occur in numbers they are very injurious or even quite fatal to the hive. They appear to enjoy immunity from the stings. A smaller species (*G. alvearia*) is

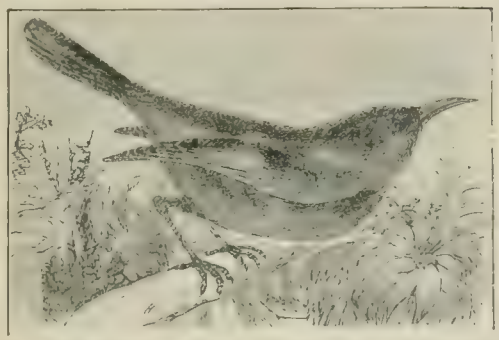
Honeycomb Moth:
1, Gallleria mellonella (male); 2, larva; 3, pupa; 4, cocoon; 5, larva in its way through the hive; 6, Galleria alvearia (male).

also distinguished by some authorities. Humblebee nests are infested as well as bee-hives.

Honey-dew, a viscid saccharine exudation which is often found in warm dry weather on the leaves and stems of plants, occurring on both trees and herbaceous plants. It is often, but not always, associated with the presence of Aphides, Cocci, and other insects which feed on the juices of plants, and its flow is ascribed to their punctures; but the rupture of the tissues from any other cause, such as the state of the weather, seems also to produce it, and warm dry weather seems to be necessary for the production in the sap of that superabundance of sugar which is thus thrown off. Aphides themselves exude by certain peculiar organs (see APHIS) drops of a fluid which is called honey-dew, which probably differs considerably from the direct exudation of the plants on which they feed, but mingles with it where they abound. Honey-dew is often so abundant as to fall in drops from one leaf to another on to the ground, sometimes falling from trees even as a copious shower. Different kinds of manna are the dried honey-dew or saccharine exudation of certain plants. See MANNA. But very generally this exudation, as it dries, coats the surface of leaves and branches with a clammy film, to which everything brought by the atmosphere adheres, and on which moulds and other small fungi soon grow, and thus the pores of the plant are clogged and its health is impaired. Gardeners are therefore careful to wash off honey-dew with the syringe. Orange and lemon plantations sometimes suffer great injury from the abundance of honey-dew; and it has proved a cause of very great loss in the coffee-plantations of Ceylon.

Honey-eater, or HONEY SUCKER, the name of a large family of birds, Meliphagidæ, tribe Tenuirostres, order Insessores, characterised by their long, sharp, slender, curved bills, and their long cleft extensile tongue terminating in a pencil of bristle-like filaments. They are entirely confined to Australia and the islands included in the Australian region, where they are very abundant, living on honey and insects, which they are particularly well adapted for gathering from the flowers of such trees as the Eucalyptus and Banksia. Twenty-three genera and 190 species are enumerated. Several of the genera are confined to Australia, others to New Zealand, and a few range over the whole Australian region. In India and Africa they are replaced by the Sun-birds (Nectariniidæ). They are birds of active habits and generally very beautiful

plumage. One species, called by the Australians the Rifleman or Rifle-bird (*Melipliaga* or *Ptilotis paradiseus*), is said to be the most gorgeously-plumaged of all known birds; the female is more sombre in dress. Another species (*Myzantha melanophrys*) is called the Bell bird, because its voice resembles the tinkling of distant sheep-bells.



New Holland Honey eater (*Meliphaga Nova Hollandiæ*).

To this family is referred the Parson-bird or Tui (*Prosthemodera Novæ Zeelandiæ*), a bird larger than a blackbird, and of a bluish or greenish-black colour, with white streaks on the back of the neck, a white spot on each wing, and two tufts of snow-white downy curly feathers ornamenting the sides of the throat. Unlike most of the Meliphagidæ it is a bird of fine song. It has also great powers as a mocking-bird, readily learns to speak many words, and becomes very familiar in domestication.

Honey-guide, Indicator, or Moroc, a genus of birds (Indicator) formerly classed as cuckoos, and to an extent partaking of their habits, but now ranked as a small separate family (Indicatoridæ), perhaps most nearly allied to the woodpeckers and barbets. Of eleven species known eight are peculiar to Africa. They are all birds of similar coloration, being generally of a dull gray tinged with yellow or olive; they vary considerably in size, the larger species measuring about 8 inches in length, the smaller not exceeding four inches. They have acquired their name from their habit of guiding men to honey, a curious instinct prompting them to hop from tree to tree before the traveller whose notice they have succeeded in attracting by fluttering and uttering a peculiar cry, and to lead to a place where a bees' nest may be found. The cry is said to change in character on reaching the locality of the nest.

Honey Locust Tree (*Gleditschia triacanthos*), also known as the Sweet Locust and Black Locust, and in Britain as the Three-thorned Acacia—a lofty and beautiful tree of the natural order Leguminosæ, sub-order Cæsalpiniæ, a native of the valleys of the Alleghanies and of the basin of the Mississippi. It is not found wild on the Atlantic coast of North America, although often planted for ornament in the vicinity of habitations. The flowers—which are small, greenish, and in spikes—have, when perfect, six stamens and one pistil, but are very generally unisexual. The leaves are twice pinnate, without terminal leaflets, the numerous small leaflets giving a peculiar gracefulness to the foliage, which is of a light shining green. The tree is furnished with numerous sharp triple spines. The pods are long, flat, pendulous, often twisted; the seeds large, brown, and enveloped in a pulp, which, when the pod is ripe, is very sweet. Sugar has been made from it, and when fermented it yields an intoxicating beverage in use among the American Indians. The honey locust attains a height of 70 or 80 feet. Trees of large size are to be seen in some parts of Britain. The wood resembles that of the Locust Tree (q.v.), or False Acacia (*Robinia pseudacacia*), but is more coarse-grained.

Honey-stone, or Mellite, a mineral of remarkable characters and composition, found in connection with brown coal (generally accompanied by sulphur) in several places in Germany. It occurs in square octahedrons, looks like a honey-yellow resin, and may be cut with a knife. It is a mellate of alumina, consisting of mellitic acid, alumina, and water.

Honeysuckle (*Lonicēra*, or, according to some botanists, *Caprifolium*, which others make a sub-genus of Lonicera), a genus of plants of the natural order Caprifoliaceæ. They are shrubs, often twining, and have the flowers two or more together in axillary heads. The calyx is short and 5-toothed; the corolla tubular-funnel shaped, 5-cleft, generally two-lipped; the fruit a 2- or 3-celled berry, containing one or very few seeds. The Common Honeysuckle, or Woodbine (*L. Periclymenum*), is very abundant in woods and thickets in most parts of Britain. On account of its beautiful cream-coloured whorls of flowers, and their delicious fragrance, it is often planted in shrubberies and trained against walls. It is said to be the 'twisted eglantine' of Milton. The phenomena observed in its growth have been adduced in proof of a *perceptive power* in plants; the branches shooting out till they become unable to bear their own weight; and then, on their meeting with any other branch, twining around it, from right to left; but if they meet only with one another, twining in different directions, one to the right, and another to the left.—Very similar to this is the Perfoliate Honeysuckle

Perfoliate Honeysuckle (*Lonicēra caprifolium*). *a*, flower; *b*, fruit.

(*L. caprifolium*), with paler whorls of flowers, and remarkable for having the upper leaves united so that an opposite pair form one leaf, through the middle of which the stem passes. This peculiarity is confined to the flower-bearing shoots, and does not occur on the young runners; it is also most perfect nearest the flower. This species is a native of the south of Europe, but is now naturalised in many parts of Britain, and much planted, as, although less powerfully fragrant than the Common Honeysuckle, it flowers earlier.—There are numerous other species, natives of Europe, Siberia, and North America. The Fly Honeysuckle (*L. Xylosteum*) is an erect shrub, a native of Europe and Asia, scarcely indigenous in Britain, but common in shrubberies. Its branches are not unfrequently used in some parts of Europe for tubes of tobacco-pipes; and it is said to make good hedges in dry

soils. Other erect species are not unfrequently planted in shrubberies. The Trumpet Honeysuckle (*L. sempervirens*), called in America the Coral Honeysuckle, is a native of the southern states of North America, often planted in Britain on account of its beautiful flowers, red on the outside, and scarlet within, which, however, have no fragrance. It is a twining evergreen shrub. The berries of the honeysuckles are nauseous. The name honeysuckle is also given to shrubs very different from this genus, but of which the flowers abound in honey, as to species of Banksia in Australia. *Azalea viscosa* is called Swamp Honeysuckle in North America. See also FRENCH HONEYSUCKLE.

Honfleur, a seaport in the French department of Calvados, is situated on the southern side of the Seine estuary, opposite to Havre, from which it is 7 miles distant. It is irregularly built, dirty, and uninteresting. There is a school of hydrography, and one of its churches is a celebrated place of pilgrimage to sailors. The commerce of Honfleur, once of much greater importance than at the present time, has been absorbed in great measure by Havre. But the harbour and its approaches were greatly improved in 1874–81, and there is still a considerable export of eggs, butter, poultry, corn, and cattle, mostly to England, and import of iron and coal, and of timber from Norway. The principal manufactures are leather, cast-metal, and refined sugar. There are also rope-walks and shipbuilding yards. Pop. 9265.

Hong-kong, or HIANG-KIANG ('sweet waters'), an island of southern China belonging to Great Britain, situated on the east side of the river Canton, and about 90 miles S. by E. from the city of Canton. It consists principally of a rugged ridge of granitic rocks, extending from north-west to south east, and has an area of 29 sq. m. Barren and desolate, with scarce any traces of cultivation, the island itself presents a striking contrast with the beauty of its harbour, a magnificent sheet of water, 10 sq. m. in extent, one of the finest in the world, which stretches between the northern shore of Hong-kong and the peninsula of Kowloon on the opposite mainland. The straits that separate the two are scarcely half a mile wide on the east, but expand greatly towards the west.

It is to the excellence of its harbour, to the fact that it has been made a free port, and to its being the headquarters of European finance in eastern Asia, that Hong-kong owes its importance as the principal commercial entrepôt of southern China, if not of eastern Asia. The annual value of the merchandise brought into Hong-kong ports exceeds £19,000,000, and the value of that carried thence is more than £22,000,000. The trade between Hong-kong and Great Britain amounts to a value of 3 million pounds sterling for exports from Hong-kong, and more than 1¾ million for imports into Hong-kong. The principal objects of commerce are opium (imported) and tea and silk both exported; the Chinese trade in these last two commodities is almost exclusively in the hands of Hong-kong merchants. Other articles of trade are sugar, flour, rice, salt, hemp, copper, lead, iron, woollens, earthenware, nut-oil, amber, cotton, sandalwood, ivory, betel, vegetables, live-stock, granite, and shipping stores. The last named, together with sugar, rum, ice, and ropes, are the chief manufactures on the island. Hong-kong is in regular steam communication with Europe, India, Singapore, Australia, Japan, Canada (Vancouver), and San Francisco. Every year several thousand Chinese coolies pass through the port going abroad and returning home. In the five years ending 1890 the emigrants averaged 66,700 annually; in 1894 the immigrants were more than 96,000. The mean annual temperature is 75° F. The summer is hot and generally rainy; but the island is not unhealthy upon the whole, except at certain seasons. In 1894 it was ravaged by a bubonic plague like that of the Middle Ages (see Eitel's *Europe in China: the History of Hong Kong*, 1895). Thunderstorms are frequent, and typhoons occasionally work great havoc. An observatory is maintained on the island. From 5000 in 1841 the inhabitants increased to 37,058 in 1851, and to 123,511 in 1861, to 123,898 in 1871, to 160,402 in 1881, and 221,441 in 1891—210,995 being Chinese (partly British subjects), and 1901 Indians. Of the whites, half are of Portuguese origin, and a third English. Hong-kong is the seat of a British governor and is a British naval station (see COALING STATIONS). The city of Victoria, the capital of the island, stretches some 4 miles along the northern shore, and from its situation on the slopes and terraces of the hills overlooking the harbour and its handsome streets and houses, is justly entitled to be called one of the finest cities in the East. Here dwell all the Europeans and most of the Chinese portion of the population. On the mainland the extremity of the peninsula of Kowloon, embracing an area of 2⅜ sq. m., was ceded to Great Britain in 1861, and now forms administratively part of the dependency of Hong-kong. The island was first occupied by Great Britain in 1841, and was secured to her in the following year by the treaty of Nanking.

Honiton, a market-town and municipal borough (1846) of Devonshire, near the left bank of the Otter, 17 miles by rail ENE. of Exeter. Four times devastated by fire between 1747 and 1797, it is a modern well-built place; but its old parish church, on a hill, contains a fine oak-screen, erected in 1482 by Bishop Courtenay of Exeter. The famous Honiton pillow-lace, a manufacture introduced here by Flemish refugees in the middle of the 16th century, is still a specialty of the district (see LACE). The beautiful vale of Honiton is famous for its butter. Honiton was disfranchised in 1868. Pop. (1851) 3427; (1891) 3216.

Honolulu, the capital of the Hawaiian or Sandwich Islands, is situated on the southern coast of the island of Oahu. It is at once the seat of government and the commercial centre of the Hawaiian state; but it was not originally the capital, and its importance is of modern growth, being due to the fact that its harbour is the only really well-protected port in the Archipelago. The harbour, which has attracted to Honolulu first whaling vessels and subsequently traders of all

kinds, is not a large one. It is entered through an opening in the coral-reef, is 150 yards wide at the entrance, and extends for rather more than a mile in a north and south direction. The town stands close to the shore, on a narrow plain at the mouth of the Nuuanu valley, which runs back between cliffs into the main range of Eastern Mountains. The strip of flat land on which the town is built is naturally bare and dry, and the mountains, which protect the harbour from the north-easterly trade-winds, also keep off the rain, so that the rainfall at Honolulu is much smaller than in some other parts of the islands. Water-works, however, supply irrigation, which keeps the gardens of the town bright with flowers and foliage. The centre of the town is well laid out in rectangular streets, with houses built in European style; most of the appliances of civilisation are to be found, notably telephones; there are fine government buildings, and an interesting public library. The climate is pleasant, the least healthy time being when southerly or south-westerly breezes blow; food-supplies are plentiful; and ships running between America and Asia or Australasia constantly call at the port. The population is estimated at over 20,000, including a large number of foreigners; for the trade is almost entirely in foreign hands, and the town is described as 'having a thoroughly American aspect.' See also HAWAII.

Honorarium. See FEES.

Honorius, FLAVIUS, second son of the Roman emperor, Theodosius the Great, was born in 384. On the death of his father the empire was divided between him and his brother Arcadius, Honorius receiving the western half, with Rome as his capital. Being only ten years old, he was put under the guardianship of Stilicho (q.v.), who was the *de facto* ruler of the western empire until 408. After the death of Stilicho, who had been the strong bulwark of western Rome against the barbarian invasions, Alaric the Goth overran Italy, and besieged Rome, and took it in 410. A new champion of the empire arose in Constantius, who was appointed the colleague of Honorius in the consulship, and received in marriage (417) the hand of his sister Placidia, along with a share in the empire. But he did not long enjoy his good fortune, as his death took place a few months after. Thereafter things went from bad to worse in the empire, and the weak Honorius lost his hold of the fair provinces beyond the Alps, whilst Africa was a seething caldron of revolt and civil war. The first emperor of the West died in 423, at Ravenna, which he had made his capital in 403. See J. B. Bury's *History of the Later Roman Empire* (1890).

Honorius I., who succeeded Boniface V. as Bishop of Rome in 625, was born of a consular family in Campania. His name is connected with the history of the paschal controversy in Ireland and with that of the early Anglo-Saxon Church. During his pontificate the bishopric of York was elevated to the rank of an archbishopric, and the festival of the Elevation of the Cross was instituted. At the height of the Monothelite (q.v.) controversy Honorius, at the suggestion of Sergius, patriarch of Constantinople, abstained from condemning the new doctrines, and for his lukewarmness in so doing was stigmatised as a heretic at the Council of Constantinople (680). He died in 638, and was succeeded by Severinus. Some letters of his are preserved in Labbe's *Collectio Conciliorum*, vol. iii.

Honour, MAIDS OF. See HOUSEHOLD.

Honourable, a title given in the United Kingdom to the younger sons of Earls, and all the children of Viscounts and Barons; to Maids of Honour, Lords of Session, the Supreme Judges of England and Ireland. For the persons entitled to be styled 'Honourable,' 'Most Honourable,' and 'Right Honourable' respectively, see ADDRESS (FORMS OF). In America custom attaches the title of Honourable to the names of governors of states, judges, members of congress, and other public functionaries.

Honours, MILITARY. See SALUTES; and for Honours of War, see CAPITULATION.

Hontheim, JOHANN NIKOLAUS VON, was born at Treves, 27th January 1701. He was educated in the Jesuit school of his native city, studied canon law at Louvain, and afterwards taught it for ten years at Treves, of which see he became suffragan bishop in 1748. He is the author of two works on the history of Treves, *Historia Trevirensis Diplomatica* (3 vols. 1750) and *Prodromus Historiæ Trevirensis* (2 vols. 1757). But he is chiefly memorable for a theological essay in Latin, *On the State of the Church and on the Legitimate Authority of the Roman Pontiff* (1763). This he published under the *nom de plume* of Justinus Febronius, whence the system of church government which the work propounds has been called Febronianism. His scheme may be described as an exaggerated form of Gallicanism, with the democratic element of congregationalism superadded. The work was condemned by Clement XIII. immediately after its appearance. When it became known in 1778 that Hontheim was the author, Pius VI. required from him a retractation of his doctrines. But three years later in his *Commentarius* Hontheim repeated his old views. He died at Montquintin in Luxembourg, September 2, 1790. See O. Mejer, *Febronius* (Tübingen, 1885).

Honthorst, GERARD VAN, Dutch painter, born at Utrecht on 4th November 1590, and died there on 27th April 1656. He was a member of the painters' guild of Utrecht (1622–37) and of that of The Hague (1637–52). He twice visited England (1620 and 1628), and painted portraits of the royal family and an allegory (now at Hampton Court). He also found patrons in Elizabeth of Bohemia and the princes of Orange. His best pictures are imitations of Caravaggio, whose works greatly influenced him whilst studying in Rome; he was particularly fond of painting interiors dimly illumined by lamps or candles. The 'Liberation of St Peter,' the 'Martyrdom of St John,' the 'Musician,' the 'House in the Wood,' and the portraits of Mary de' Medici, the king and queen of Bohemia, and the Duke of Buckingham may be taken as representative of his skill.—His brother WILLIAM (1604–66), an historical and portrait painter, worked for the court of Berlin from 1650 to 1664.

Honvéd ('Land-defenders'), the name given in Hungary under the earlier kings to the national champions. In the summer of 1848 the term was revived, and applied first to the revolutionary armies, and after the organisation of the Hungarian landwehr in 1868 to that body of men.

Hood. The academic hood is a modification of the monks' cowl; the right to wear hoods is bestowed by universities and by certain chartered colleges, and the value and source of the wearer's degree are indicated by the material, shape, and colour of the hood. A very complete list of university and other degrees and hoods is given in *Whitaker's Almanack*.

Hood, MOUNT. See CASCADE RANGE.

Hood, ALEXANDER, Lord Bridport, admiral, born in 1727, was the younger son of the vicar of Thorncombe, near Axminster, and younger brother of the more famous Viscount Hood. The date of

his entry into the service was 1741. Both the Hoods entered under the patronage of Admiral Smith, called 'Tom of Ten Thousand.' There has been some confusion between the exploits of the brothers—thus a victory at Hyeres, in command of the *Antelope* in 1757, has been erroneously attributed to the younger brother. In 1746 Alexander Hood became lieutenant, and in 1756 attained the command of the *Prince George* (90 guns). After service in the Mediterranean and Channel under Saunders and Hawke, he again distinguished himself in 1760, while in command of the *Warwick* frigate (32 guns), by recapturing from the French the *Warwick*, a 60-gun ship formerly English, but now armed with 34 guns. During the war of American independence he served much under Keppel, Rodney, and Howe in the Channel and the Strait of Gibraltar. In the notorious Keppel court-martial he appeared not wholly to his credit. During the French revolutionary war he served in the Channel with distinction, having a share in 1794 in the 'glorious first of June' off Ushant, and afterwards in command of blockading squadrons. He attained flag rank in 1780, and was raised to the peerage as Baron Bridport of Cricket St Thomas, Somerset, in 1796, and Viscount Bridport in 1800. He died 3d May 1814. See the *Naval Chronicle*, vol. i.; the Rev. T. Keppel's *Life of Lord Keppel*, and Lord Bridport's *Letters*, edited by Hannay for the Navy Records Society (1895).

Hood, John Bell, an American general, was born at Owingsville, Kentucky, 1st June 1831, graduated at West Point in 1853, and saw some service against the Indians. He entered the Confederate army, commanded a brigade, and was severely wounded at Gaines's Mill, at Gettysburg, and at Chickamauga, where he lost a leg and was made lieutenant-general. He commanded a corps under General J. E. Johnston in the retreat to Atlanta, and in July 1864 succeeded him in command of the army. On September 1 he was compelled to evacuate the city, and leave the road free for Sherman's march to the sea. He yet made a bold attempt to cut Sherman's communications, and, though worsted at Franklin on November 30, pushed as far north as Nashville; but here he was again defeated by Thomas on December 16, and at his own request he was relieved of command. He died in New Orleans, 30th August 1879. His personal experiences were published posthumously as *Advance and Retreat* (1880).

Hood, Robin. See Robin Hood.

Hood, Samuel, Viscount Hood of Whitley, admiral, elder brother of Lord Bridport, was born at Thorncombe in 1724, and entered the navy in 1740 under Commodore Smith on board the *Romney*. He was promoted lieutenant in 1746, commander in 1751, [illegible] and post-captain in 1756. While in that rank he commanded the *Vestal* frigate of 32 guns, in which he took a French frigate of equal force after a bloody contested action. After much other service at sea he [illegible] of Portsmouth dockyard in 1778. In 1780 he was promoted to flag rank, and sailed almost at once in command of a squadron to reinforce the North American and West Indian stations under the orders of Rodney. He remained in these waters till peace was signed; and, as they were the great scene of the naval war, he had many opportunities of distinguishing himself. In April 1781 he fought an action with De Grasse off the Diamond Rock, and in July of the same year Rodney having gone on [illegible] Hood was left in command in the battle off the Chesapeake. In January 1782 he [illegible] in the West Indies and showed himself a tactician of the most brilliant kind by the masterly series of manœuvres by which he outwitted De Grasse in the actions fought in the Basseterre Roads off the island of St Kitts. When Rodney arrived to take command with the reinforcements from England, Hood became again his second in command. In that rank he had a conspicuous share in the winning of the decisive victory of the 12th April, commonly called the battle of Dominica. The brunt of the preliminary action of the 9th fell on his division, and on the 12th he led the rear of the English line. For his services on this occasion he was made Baron Hood of Catherington in the Irish peerage. In 1784 he stood against Fox for Westminster, and was elected. He became a Lord of the Admiralty in 1788. When the great revolutionary war broke out in 1793, he was appointed to the Mediterranean. In that position he directed the occupation of Toulon and the subsequent operations in the Gulf of Lyons and on the coast of Corsica. He hauled down his flag in 1795. In 1796 he was made Viscount Hood in the peerage of Great Britain, and he died at Bath, 27th June 1816. Lord Hood had the reputation of being a consummate tactician. Nelson, who served under him, considered him the ablest of our admirals in the early years of the war, and it is said that a plan he drew up for an attack on a French fleet at anchor, which was prevented by foul winds, had some share in inspiring the plan of attack adopted in the battle of the Nile. See *Naval Chronicle*, vol. ii. pp. 1–46; Mundy's *Rodney*; Nelson's *Letters and Despatches*; James's *Naval History*.

Hood, Thomas, poet and humorist, was born on the 23d of May 1799, at No. 31 the Poultry, in the City of London, where his father carried on the business of a publisher in partnership with a Mr Vernor. Thomas Hood the elder was a native of Scotland, the son of parents in humble circumstances, near Errol, on the north bank of the Tay, between Perth and Dundee. Originally bound apprentice to a bookseller in Dundee, he had proceeded to London, and finally became member of the firm just mentioned. He was himself a man of some turn for authorship, and even wrote a couple of novels now forgotten, so that his more distinguished son was born, as he expressed it, 'with ink in his blood.' The elder Hood married the sister of Mr Sands, an engraver of some repute, from whom Thomas Hood probably received his first impulse towards art and artistic associations. To Thomas Hood, the publisher, and his wife, were born a family of six children, two sons and four daughters, of whom Thomas was the second son. There was a tendency to consumption on the mother's side, for the malady was fatal to the elder son James and to two of the daughters, and in the sequel to Mrs Hood, and was at the root of those complicated disorders which made the life of Thomas Hood 'one long disease.' The father contracted a chill while nursing his elder son, and died after a few days' illness in 1811, when Thomas was only twelve years old, leaving the widow and remaining children in reduced circumstances.

In his [illegible] autobiography written by Hood in 1839, and published in the first series of *Hood's Own*, he tells us that he owed his earliest instruction to two maiden ladies, of the name of Hogsflesh, who had a small school in Token House Yard; that he was then sent to a suburban boarding-school (the 'Clapham Academy' of his famous Ode), and ultimately to a day-school at Clerkenwell, where his mother went to reside after her husband's death. His education, ordinarily so called, closed at this point; and after the age of thirteen or fourteen his own keen and

catholic love of reading was the foundation of that singular versatility and resource which marked both his poetic and his humorous vein. For the next two years of his life there is some uncertainty as to his pursuits. According to his own account, he was now placed, through the influence of a friend of the family, in a merchant's counting-house in the city, but his health proving unable to stand the confinement to the desk, he was shipped off to Dundee, where relations of his father were living, among whom he resided for some three years, from 1815 to 1818.

These three years were important in Hood's life. The threatened consumption was for a time warded off—the boy led the healthiest of outdoor lives in fishing and boating—he had ample leisure besides both for reading and sketching, and he began to practise his pen both in verse and prose in the pages of local newspapers and magazines. In 1818 he returned to London with his health apparently re-established, and entered the studio of his uncle, the engraver. After a short apprenticeship of only two years he began to work on his own account, until, the literary instinct beginning to wax far stronger than the graphic, he seems to have discovered where lay the true field for his genius. About the same time the *London Magazine*, losing its editor, John Scott, and passing into the hands of Taylor and Hessey, Thomas Hood, then a young man of two-and-twenty, was appointed sub-editor.

Nothing more propitious for Hood's genius could have happened. It emancipated him for ever from the engraver's desk, the drudgery and constraint of which were seriously affecting his health, and it threw him at once into a society of writers best fitted to call forth all that was best in him. He now found himself in daily companionship with such men as Procter, Cary, Allan Cunningham, De Quincey, Hazlitt, and, above all, with Charles Lamb, with whom a close friendship sprung up, destined to be one of the best influences of Hood's literary life. It was, however, the intimacy with John Hamilton Reynolds, whose sister he married three years later, that more than all the rest served to encourage and train Hood's poetic faculty. John Keats had died early in 1821, the year that Hood joined the magazine, and it does not appear that they ever met; but Reynolds had been the close friend and disciple of Keats, and Hood passed at once under the same fascinating influence. Between July 1821 and July 1823, besides other and lighter contributions to the *London*, Hood wrote and published in the magazine some of the finest of what may be called the poems of his Keatsian period. *Lycus the Centaur*, the *Two Peacocks of Bedfont*, the *Ode to Autumn*, and others—poems which have never materially increased Hood's fame with the ordinary reader, chiefly because Hood the humorist appeals to a larger audience than Hood the poet, and the world is always indisposed to allow credit to a writer for gifts of very opposite kinds. And although in the class of subjects, and in the very titles of these poems, as well as in turns of phrase and versification, the influence of Keats is unmistakable, the poems show quite as markedly the result of an ear and taste formed upon a loving study of the narrative poems of Shakespeare. And 'over all there hung' a tender melancholy observable in all Hood's serious verse, engendered in a personality on which from the beginning there rested the shadow of impending fate. In spite of real and original poetic quality, these poems, issued anonymously, failed to attract notice, and when in 1827 he produced them with others of still finer quality in book-form, the volume fell all but dead from the press.

A different fate attended an earlier venture in 1825, when Hood and his brother-in-law Reynolds published (also anonymously) the little volume entitled *Odes and Addresses to Great People*. While writing serious poetry in the *London* it had fallen to Hood's lot to act as 'comic man' or humorous chorus to the magazine, and as such to invent facetious answers to correspondents, real or imaginary. Among these he had inserted a burlesque *Ode to Dr Kitchener*, exhibiting a verbal wit of quite different flavour from the ordinary. The success of this trifle seems to have suggested a collection of similar odes, to which Reynolds contributed a few. But Hood's was far the more conspicuous share, revealing a wealth of humorous ingenuity that at once attracted notice. Coleridge wrote, attributing the book to Lamb, as the only writer he knew capable of the achievement. The book passed rapidly through three editions, and practically determined the chief occupation of Hood for the remainder of his short life. His musical melancholy verse had brought him no recognition. His first facetious efforts had gained him an audience at once. From that day forth the vein thus opened was to be worked, in health and in sickness, with the grain and against the grain, for twenty years of anxiety and struggle.

For Hood had married in 1824 contrary, it is to be feared, to all counsels of prudence. The marriage was one of truest affection, but it could hardly have been acceptable to Mrs Hood's family, for Hood had no means of support but his pen, and his health was already matter of serious anxiety. The marriage soon produced strained relations with the Reynoldses, and in the end a complete estrangement from Hood's early friend and brother-in-law. The *Odes and Addresses* were followed in 1826 by the first series of *Whims and Oddities*, where Hood first exhibited such graphic talent as he possessed (he said of himself that, like Pope's 'tapetied curtains,' he was 'never meant to draw') in these *picture-puns* of which he seems to have been the inventor. A second series of *Whims and Oddities* appeared in 1827, dedicated to Sir Walter Scott, followed without delay by two volumes of *National Tales*, the least characteristic and noticeable of Hood's writings. In 1829 he edited *The Gem*, one of the many fashionable annuals then in vogue—a remarkable little volume, for besides Charles Lamb's 'Lines on a Child dying as soon as born,' written on the death of Hood's first child, it gave to the world Hood's *Eugene Aram*, the first of his poems showing a tragic force of real individuality.

Hood and his wife, who passed the first years of their married life in Robert Street, Adelphi, left London in 1829 for a cottage at Winchmore Hill, a few miles north of the metropolis, where he schemed the first of those comic annuals which he produced yearly and single-handed from 1830 to 1839. In 1832 he left Winchmore Hill for an old-fashioned house at Wanstead, in Essex, forming part of the old historic mansion, Wanstead House, where the romantic scenery of the park and neighbourhood furnished him with a background for his one novel, *Tylney Hall*, written during the next two years, and published in three volumes in 1834—a story of a conventional melodramatic type, with an underplot of cockney life and manners, not without many touches of Hood's peculiar charm, but on the whole a failure. He never repeated the experiment of prose romance.

In 1834 the failure of a publisher plunged Hood into serious money difficulties by which he was hampered for the rest of his life. After the birth of his second child, a son, in January 1835, and the dangerous illness of Mrs Hood which followed, the family went abroad and settled for two years at Coblenz on the Rhine, and for the next three years at Ostend. During these five years Hood,

struggling against the slow progress of a fatal disease, continued to produce his *Comic Annual's* and other lighter matter, and schemed his *Up the Rhine*, a humorous account of the proceedings of an English family in Germany, told in letters, and too obviously imitated from *Humphrey Clinker*. This, when published in 1839, at once hit the public taste, but seems to have brought little profit to its author, who, apparently destitute of all business faculty, suffered throughout his career from the misfortunes or the superior sagacity of his publishers. The sufferings of Hood during these five years were very terrible, and are only hinted by his son and daughter in their memoir of their father. In an unpublished letter to his wife in April 1840, written during a temporary visit to England from the house of his generous friend, the first Charles Wentworth Dilke, he writes: 'I find my position a very cruel one—after all my struggles to be, as I am, almost moneyless, and with a very dim prospect of getting any, but by the sheer exercise of my pen. What is to be done in the meantime is a question I ask myself without any answer but—Bruges jail. At the very moment of being free of Bailey, am I tied elsewhere, hand and foot, and by sheer necessity ready to surrender myself that slave, a bookseller's hack!'

By the kindness of friends Hood was enabled to return to England, with security from his creditors, in 1840. Disease of lungs and heart was now so far advanced that the fatal issue was only a question of time, but he continued to struggle on bravely and cheerfully for five years longer. In 1841 he was offered by Colburn the editorship of the *New Monthly Magazine* at a salary of £300 a year, a post which he filled for two years, when, a difference arising with the proprietor, he resigned the editorship, and in January 1844 started a new periodical of his own, *Hood's Monthly Magazine*, destined to be his last literary venture. Meantime in the Christmas number of *Punch* (1843) had appeared the 'Song of the Shirt;' and in *Hood's Magazine*, during its brief career, there followed the 'Haunted House,' the 'Lay of the Labourer,' and the 'Bridge of Sighs,' proving that, as the darkness of his own prospects deepened, the sympathies with his kind deepened also, and quickened his finest genius. Only a few months after the starting of the magazine a notice to the subscribers had to tell that the health of the editor was rapidly failing. Towards the end of the year his friends used their interest with the government of the day, and in November Sir Robert Peel wrote announcing a pension to Mrs Hood on the civil list of £100 a year. In the number of the magazine for February 1845 appeared Hood's last contribution, the touching lines, prophetic of his approaching end, beginning:

[illegible]

and ending:

[illegible]

After three more months of increasing pain and distress, Thomas Hood died at Devonshire Lodge, Finchley Road, on the 3d of May 1845. He was buried in Kensal Green Cemetery. His devoted wife, broken in health with the long attendance on her husband, survived him only eighteen months.

Hood produced in twenty-four years an amount of prose and verse of which at least one half the world might willingly let die. Of the other half, all the serious poetry is remarkable, and a small portion of first-rate excellence. Lyrics such as the 'Song of the Shirt,' the 'Bridge of Sighs,' 'Eugene Aram,' the song beginning 'I remember, I remember, the house where I was born,' and the 'Ode to Melancholy' are of an assured immortality. His humorous verse—and in the best of it, as in 'Miss Kilmansegg,' are often blended poetry, pathos, and even real tragic power—is of a kind that Hood absolutely created. Not only was he the most prolific and successful punster that ever used that form of wit, but he turned it to purposes of which no one had ever supposed it capable. It became in his hands the most natural and obvious vehicle for all his better gifts. The truth is, he brought to it the transfiguring power of real imagination, and, instead of its degrading whatever object it touched, in his hands it ministered to the noblest ends. Even in the 'Song of the Shirt,' when his deepest sympathies were involved, he uses the pun with almost magical effect, as where the poor needlewoman, confined to her squalid garret when all nature is beckoning her forth, exclaims:

[illegible]

It was Hood's misfortune that the necessity of writing for bread compelled him to write constantly below his better genius. But he has left sufficient to found a durable fame as a writer of rare individuality, who, using a discredited method, made it delightful by the imagination of a true poet and the humanity of a genuine lover of his kind.

The best account of Hood's early life is to be found in his *Literary Reminiscences*, published in the first series of *Hood's Own*. The Memoir by his son and daughter is the chief source of information about [illegible], but is a poor and unsatisfactory book. Later, in 1885, Mr Alexander Elliot, in a modest work entitled *Hood in Scotland*, has collected from persons and documents previously unconsulted some very interesting details of Hood's early residence in Dundee, and of a second visit of a few weeks paid by him to that city not long before his death.

Hoofs. The healthy soundness of the horse's foot is mainly preserved by permitting it to grow uninjured by the rasp and knife (see HORSE-SHOEING), and kept clean by being washed with cold water; all other applications are injurious and destroy the toughness of the 'horn surface.' Softness and brittleness of the hoof, which are fruitful sources of cracks and Corns (*q.v.*), may be remedied by placing the feet for several hours daily in thick woollen swabs, kept cool and moist by frequent applications of cold water, and by encouraging a more healthy growth of horn by occasional mild blisters round the coronary band. Cracks, or sand-cracks, as they are termed, mostly occur amongst horses much upon the road, cause lameness, and constitute unsoundness. When serious and recent, poulticing, thinning away of the crust about the crack, and perfect rest are essential. After the earlier heat and tenderness are removed a hot iron should be drawn at right angles to the crack, both above and below, so as to separate the diseased from the sound horn. Waxed thread or fine wire should be wound round the hoof, and a sound growth of horn stimulated by a blister round the coronet. The horse's hoofs are too hard and coarse to be employed for the making of the better class of combs and buttons, for which purpose the hoofs of cattle, to the value of nearly £5000, are annually imported into Britain. They are, however, largely used by manufacturers of prussiate of potash and artificial manures. See FOOT.

Hooghly, or HÚGLÍ, a river of Bengal Proper, the most westerly of the channels by which the Ganges reaches the sea, and commercially the most important. Taking its distinctive name near the

town of Santipur, it has a southerly course of 64 miles to Calcutta, and a further course of 81 miles in the same direction to the Bay of Bengal. Being a deltaic river, the Hooghly is much subject to being silted up, and is only kept open to navigation by the vigilant exertions of a special staff of river engineers. Even with all their care the stream is frequently dangerous, owing to shifting quicksands and moving banks and channels. In spite of these drawbacks vessels drawing 26 feet of water are safely taken up to Calcutta by the Calcutta pilots. At its mouth the Hooghly has a width of 15 miles. The Bore (q.v.) of the river frequently attains a height of 7 vertical feet. See map at CALCUTTA.

Hooghly (*Húgli*), a city of Bengal Proper, capital of a district, stands on the right or western bank of the river Hooghly, 25 miles by rail north of Calcutta. Pop. (1891) of Hooghly with Chinsura, immediately to the south, 33,060, mostly Hindus. Here is a college for English and Asiatic literature, founded by a Hindu.

Hook. See FISH-HOOK. For the HOOK (HOEK) OF HOLLAND, see ROTTERDAM.

Hook, JAMES CLARKE, painter, was born in London on 21st November 1819, his mother being a daughter of Adam Clarke, the Biblical commentator. He entered as a student of the Royal Academy in 1836, gained the first medals in the Life and Painting Schools in 1842, and in 1845 was awarded the travelling studentship of the Royal Academy for 'Rizpah watching the Bodies of the Sons of Saul.' He returned home after a stay of eighteen months in Italy, and for some time painted scenes from Italian history and literature, mostly connected with Venice, together with some few suggested by Shakespeare's plays and the Bible. Most of these were romantic in feeling, dramatic in treatment, and brilliant in colouring. In 1850 Hook was elected an Associate of the Royal Academy, and ten years later full Academician. In the meantime he had begun to work at subjects connected with the lives of the people, more especially pieces illustrating seafaring life. His powers in this line of study, his most characteristic and his best, are illustrated by the 'Widow's Son going to Sea,' 'Ship-boy's Letter,' 'Coast-boy gathering Eggs,' 'Luff, Boy,' 'Carting for Farmer Pengelly,' 'Tickling Trout,' 'A Mermaid,' amongst many others. Mr Hook is also a skilful etcher. See the *Art Journal Annual* of 1888.

Hook, THEODORE EDWARD, prince of jack-puddings, was born in London, 22d September 1788, second son of the Vauxhall composer, James Hook (1746–1827), by his first wife, the beautiful Miss Madden, who died in 1802. His elder brother, Dr James Hook (1771–1828), became in 1802 chaplain to the Prince of Wales, in 1825 Dean of Worcester, and was himself the author of a couple of novels. Theodore's education was almost limited to a year at Harrow and matriculation at Oxford; but while yet a minor he achieved celebrity as the author of thirteen successful comic operas and melodramas (1805–11), as a punster and matchless *improvisatore*, and as a practical joker—his greatest performance the Berners Street Hoax (1809), which took in the Lord Mayor, the Duke of Gloucester, and hundreds, thousands of humbler victims. Such talents claimed recognition, and in time the 'little pet lion of the green-room' gained the *entrée* of very high society. The Prince Regent himself remarked that 'something must be done for Hook;' and in 1812 that something was found in the post, worth £2000 a year, of treasurer to the Mauritius. There Hook fared gloriously, until in 1818 a grave deficiency was detected in the public chest; he was arrested and sent, almost penniless, to England. An acquaintance, meeting him at St Helena, said, 'I hope you are not going home for your health.' 'Why,' answered Hook, 'I am sorry to say they do think there's something wrong in the chest.' Himself he ascribed the 'unfortunate defalcation' to a black clerk, who had committed suicide; anyhow, though criminal proceedings were dropped, in 1823 he was pronounced a crown debtor for £12,000, and was again sold up and arrested. In 1825 he was released from the King's Bench, but not from the debt; however, he made no effort to discharge it. Meanwhile, in 1820, he had started the Tory *John Bull*, whose chief aim was to vilify Queen Caroline, and which in its palmy days brought him fully £2000 per annum. *Sayings and Doings* (9 vols. 1824–28) yielded other £4000, and nine more three-volume novels followed between 1830 and 1839—*Maxwell*, the half-autobiographical *Gilbert Gurney*, *Jack Brag*, &c. four of them first appearing in the *New Monthly Magazine*, of which Hook was editor from 1836. So he lived for a time in great style; and even after debt drove him from St James's (1831) he still dined, diced, drank, and made sport in clubs and titled houses, whilst the woman he had betrayed, the mother of his five children, was left to the loneliness of the cottage at Fulham. Shakespeare has nothing more pitiful than Hook's words to the friend who had caught him in deshabille: 'Well, you see me as I am at last—all the bucklings, and paddings, and washings, and brushings dropped for ever—a poor old gray-haired man, with my belly about my knees.' He was only fifty-two then, and a week or two later he died, 24th August 1841. He is buried in Fulham churchyard.

See his *Life and Remains*, by the Rev. R. H. Dalton Barham (2 vols. 1849), and Lockhart's *Quarterly* article (May 1843; reprinted 1851).

Hook, WALTER FARQUHAR, ecclesiastical historian, was born in London in 1798, son of Dr James Hook, afterwards Dean of Worcester. He was educated at Winchester and Christ Church, Oxford, took orders in 1821, and, after holding some minor preferments, was appointed vicar of Leeds in 1837. Here, mainly by his energy and enthusiasm, no fewer than twenty-one new churches were built in Leeds, as well as twenty-three parsonages and twenty-seven schools, while the parish church was rebuilt at a cost of £28,000. In 1859 Hook was made Dean of Chichester by Lord Derby. His leanings towards Tractarianism brought him no little unpopularity; but throughout life he maintained a high ideal of devoted churchmanship. He died 20th October 1875. A memorial church at Leeds, which cost £25,000, and was designed by Sir G. G. Scott, was consecrated in 1880.

Dean Hook's works are *An Ecclesiastical Biography, containing the Lives of Ancient Fathers and Modern Divines* (8 vols. 1845–52); *A Church Dictionary* (8th ed. 1859); *The Cross of Christ* (1873); *The Church and its Ordinances* (4 vols. 1876); and *Archbishops of Canterbury* (12 vols. 1860–76). See his *Life and Letters*, by Dean Stephens (2 vols. 1878; new ed. 1896).

Hookah (from Arabic *huqqa*, through the Hindustani; the Persian *kalyun*; also called Nargileh, from Persian *nārgīl*), the water tobacco-pipe of Arabs, Turks, Persians, Hindus, and other orientals. It consists of a bowl for the tobacco, a water-bottle, and a long flexible tube ending in the mouthpiece. A wooden tube leads from the bottom of the head or bowl down into the water in the bottle, and the flexible tube is continued downwards by a stiff tube into the space above the water in the bottle. Thus the smoke is cooled before it reaches the mouth of the smoker. Many of these pipes are beautifully decorated, or

even encrusted with gems. The *bubble bubble* of India, named from the sound produced, is a similar but simpler water pipe, made of a cocoa-nut filled with water, and two short wooden tubes at right angles, one going into the water, the other merely passing inside the top of the shell.

Hooke, ROBERT, an English natural philosopher, born at Freshwater, Isle of Wight, July 18, 1635, and educated under Busby at Westminster, and at Christ Church, Oxford. He enjoyed the patronage of the Hon. Robert Boyle, and helped him to construct his air-pump. In 1662 he was appointed curator of experiments to the Royal Society, and in 1677 became its secretary; in 1665 professor of Geometry in Gresham College, London; and after the great fire of 1666 he acted as surveyor during the works, and thus accumulated several thousand pounds, which he hid away in an old iron chest. He died at Gresham College, March 3, 1703. Hooke was a man of extraordinary inventive genius, and has justly been considered as the greatest of philosophical mechanics; the wonderful sagacity, nay, almost intuition, he showed in deducing correct general laws from meagre premises has never before or since been equalled. There was no important invention by any philosopher of that time which was not in part anticipated by Hooke. His theory of gravitation subsequently formed part of Newton's; he anticipated the invention of the steam-engine, and the discovery of the laws of the constrained motions of planets. Among his own completed discoveries are the law of the extension and compression of elastic bodies, '*ut tensio sic vis*;' the simplest theory of the arch; the balance-spring of watches and the anchor-escapement clocks; the permanency of the temperature of boiling water. The quadrant, telescope, and microscope are also materially indebted to him. Crooked in his person, he was upright in character, although solitary and penurious in his habits. His controversies with Huygens, Hevelius, and others brought him but little credit.

Hooker, MOUNT, a peak in the Canadian Rockies, 15,690 feet high, situated on the east boundary of British Columbia.

Hooker, JOSEPH, an American general, was born at Hadley, Massachusetts, 13th November 1814, graduated at West Point in 1837, and served with distinction in the war with Mexico, gaining the brevets of captain, major, and lieutenant-colonel, and his captain's commission. In 1853 he retired from the army, and bought a farm in California; but in 1861 he offered his services to the Union government, and was at once appointed a brigadier-general of volunteers, and major-general in 1862. He commanded a division of the 3d corps in the Peninsular campaign, and won for himself, by his coolness and gallantry, the nickname of 'Fighting Joe.' In the battles of June 1862, during the famous 'change of base,' his division rendered important services; and it was his defeat of Ewell (August 27) that compelled the enemy to evacuate Manassas. Advanced to the command of the 1st corps, he gallantly carried the position on the right of the gap at South Mountain; and he opened the battle at Antietam, where he was wounded, and won his promotion to the grade of brigadier-general in the regular army. He commanded the centre grand division in Burnside's unsuccessful attack on Fredericksburg in December 1862; and in January 1863 he succeeded him in the command of the Army of the Potomac. With this force (about 120,000 men) he was confident of effecting Lee's destruction; and about the end of April, throwing a detachment of 30,000 men across the Rappahannock below Fredericksburg, he crossed at the fords above with his main body, and marched through the Wilderness to near Chancellorsville, where he awaited Lee's attack. The Confederate troops numbered barely 50,000, but the greater part of this force, under Jackson (q.v.), turned the National flank, and, attacking the rear on May 2, threw part of Hooker's army into confusion. On the following day an impetuous attack by the whole Confederate line drove Hooker from the field, and he withdrew to the north side of the river. This defeat and retreat were regarded at headquarters as inexcusable; and, in spite of his skilful management of his army when Lee invaded Pennsylvania, he was superseded by Meade before the end of June. In November, with the 20th corps, he gallantly carried Lookout Mountain, and took part in the attack on Missionary Ridge. He accompanied Sherman in his invasion of Georgia, and served till the fall of Atlanta. He was brevetted major-general in the regular army in March 1865, and in 1868, having become incapacitated by paralysis, retired with the full rank of major-general. He died 31st October 1879. Unfortunate in his one separate command, Hooker still retained too much self-esteem to be altogether a model lieutenant; yet this failing has been nearly forgotten in the memory of his personal bravery, his skill as an organiser, and his undoubtedly important services.

Hooker, SIR JOSEPH. See under HOOKER, SIR WILLIAM.

Hooker, RICHARD, the greatest of English philosophical theologians, was born in or near the city of Exeter about the end of March 1554. At an early age he showed a 'quick apprehension of many perplext parts of learning,' and through the influence of his uncle, John Hooker or Vowel (1525-1601), chamberlain of the city, was brought under the notice of Jewel, Bishop of Salisbury, and sent, partly at his expense, to his own college, that of Corpus Christi, Oxford, where Walton tells us he was admitted a clerk in 1567. After his patron's death in 1571 he was befriended by Sandys, Bishop of London, who committed his son Edwin to his care. Another pupil was George Cranmer, grand-nephew of the archbishop, and both became famous men, and remained his constant friends in later life. In his nineteenth year Hooker became scholar of his college, graduated M.A. in 1577, and was soon after admitted Fellow. His progress in learning is seen by his intimacy with Henry Saville, and by his being chosen in 1579, in the illness of the Hebrew professor, to read the lecture. Three months later Walton tells us that he was for a short time expelled by the vice-president for some forgotten college quarrel, along with his tutor and friend, Dr John Rainolds, but soon after restored. After about three years' residence he took orders, and ere long was appointed to preach at St Paul's Cross. This necessity appears to have been a severe ordeal to his modest nature, the more so that the weather proved very unfavourable for his journey; but, says Walton, 'a warm bed, and rest, and drink proper for a cold, given him by Mrs Churchman [the Shunamite at whose house the preachers were lodged], and her diligent attendance added unto it, enabled him to perform the office of the day, which was in or about the year 1581.' But the scheming widow's kindness proved too much for the simple-minded scholar. He was led into a marriage with her daughter Joan, who brought him neither beauty nor portion, was 'clownish and silly' in Wood's phrase, and, what was worse, proved both a shrew and a scold. Every reader knows Walton's account of the visit of Sandys and Cranmer to their old master at his living of Drayton-Beauchamp, in

Buckinghamshire, whither he had retired. They found him tending the sheep, his Horace in his hand, and not long after they reached the house Richard was called from their company to rock the cradle. Soon after this Hooker was transferred, at the recommendation of Archbishop Sandys, and through the influence of Whitgift, to the Mastership of the Temple, against a strong effort made to promote the afternoon reader Travers, a prominent Puritan leader. The union of the colleagues, as might have been expected, was not a happy one. Travers was the more popular preacher, if the less profound thinker, and Fuller tells us that 'the congregation in the Temple ebbed in the forenoon and flowed in the afternoon.' The sermons of Travers soon became attacks upon what he considered the latitudinarianism and errors of Hooker, and, indeed, as Fuller says pointedly elsewhere, 'the pulpit spake pure Canterbury in the morning, and Geneva in the afternoon,' a state of matters that Whitgift soon put an end to by silencing Travers. The fiery Puritan appealed to the Council with a series of set charges against Hooker's doctrine, and Hooker answered him with masterly conclusiveness and temperance. But having been drawn into this personal controversy against his inclination, he felt it to be his duty to set forth the larger question of the real fundamental basis of all church government, and to this end desired Whitgift to remove him to some quiet living, 'where I might behold God's blessing spring out of my mother earth, and eat my own bread without oppositions.' Accordingly, in 1591 he accepted the living of Boscombe, six miles from Salisbury, becoming also sub-dean and prebendary of Sarum; and here he finished four of the proposed eight books of the *Laws of Ecclesiastical Polity*, which were, however, not published till 1594 in a small closely-printed folio. The year after he removed to the living of Bishopsborne, three miles from Canterbury, where he remained till his death, unconscious of his growing fame, a parish priest of unexampled humility and devotedness. His fifth book appeared in 1597, but the author did not live to complete his work, dying about the end of the year 1600, of a cold caught in a passage by water betwixt London and Gravesend. Almost his last words were upon the 'blessed obedience and order of the angels, without which peace could not be in heaven, and, oh that it might be so on earth!' He was buried in his own church, and left his widow and four daughters behind him. Sir William Cowper, great-grandfather of the first Earl Cowper, built him a monument in Borne church, and in a poetical epitaph of his own composition applies to Hooker the famous term *judicious*, which will never be dissociated from his name.

At the time of his death the last three books were believed to be nearly complete, but if so, they were soon lost, the blame of which was laid, apparently with some justice, upon Hooker's widow and her Puritan relatives, who were supposed to abhor the theology contained in them. Some months after his death the rough drafts of the completed books that remained were reluctantly given up to the archbishop, and by him entrusted to Hooker's friend, Dr Spenser, to prepare for publication. The latter reprinted the first five books in 1604, but his further labours were interrupted, and after his appointment to be president of Corpus (1607), he entrusted the papers for transcription to a young scholar named Henry Jackson, who issued some of the *Sermons* (1612–14). But Spenser died in 1614, bequeathing the papers 'as a precious legacy' to Dr King, Bishop of London. Soon after his death in 1621 they were claimed by Abbot for Lambeth Library, where they remained till Laud's committal for high-treason, when the library was handed over first to the custody of Prynne, next of Hugh Peters. Thereafter the fate of the original papers is unknown. In 1648, as Wood tells us, but more likely in 1651, the sixth and eighth books were published at London, described as 'according to the most authentique copies,' and, indeed, we have good grounds for believing that this text is substantially genuine, being to a certain extent guaranteed to us by Bishop Andrewes and Archbishop Ussher. But, unfortunately, as Keble points out, in its present form the sixth book is an entire deviation from its subject, which should have been, according to the plan of the whole treatise, a discussion of the claim of lay elders to a share in church government, whereas about nineteen-twentieths of the whole is taken up with a series of dissertations on Primitive and Romish penance, in their several parts, confession, satisfaction, absolution. Now Hooker's discussion of lay elders would be just the part of his work most displeasing to the Puritans of his time, and the presumption is perfectly reasonable that this part of the original work was destroyed. At the same time, as Keble points out, the sixth book bears every mark of being Hooker's work, though it is not in its place as a part of the *Ecclesiastical Polity*. The seventh and eighth books, however, bear every mark of being substantially genuine; the former appeared first in 1662, in the new edition of Hooker issued by Gauden, the *soi-disant* author of the *Eikon Basilike*, and not entirely a reassuring editor. The famous Life by Walton was written for a second edition, issued in 1666, in order to correct the inaccuracies in the life provided by Gauden. Walton's account of the saintly and simple-minded theologian is one of the finest pictures in the whole range of English biography, but it should be remembered that in this case he was not sketching from life, and Keble pointed out that the super-simplicity and excessive meekness and temperance attributed to him harmonise but indifferently with the masterly intellect, the incisive irony, and keen humour that were in Hooker. All earlier editions of Hooker's works were superseded by that of Keble, published by the Clarendon Press, Oxford, in 1836, containing also Walton's Life and an exhaustive preface from his own pen. Of this work the 7th edition, revised by Dean Church and Canon Paget, was issued in three volumes in 1888. Of the first book alone there is an edition, with an admirable introduction and notes, by Dean Church (1868).

Hooker's *Laws of Ecclesiastical Polity* is the earliest great philosophical work written in the English tongue, and is a noble monument of massive prose no less than of profound thought and masterly logic. The style is neither artificial nor involved, but as well ordered and well sustained throughout as the thinking itself, while it is capable of a grave and modulated rhythm that rises at times into the region of serene yet impassioned eloquence. As a thinker he is Judicious in the highest sense of the word, and his work forms a broad and enduring foundation adequate for the church of a great nation. Its fundamental idea is that of the unity and all-embracing nature of law, considered as the manifestation and development of the divine order of the universe. The paramount law which dominates the universe is itself but the outward expression of the government of God, and is ever identical with calm and temperate reason. Reason is the criterion by which even revelation is to be distinguished as to what is eternal and immutable and what is variable according to the necessities of expediency. There is a broad distinction between natural and supernatural law, but both supplement and complete each other, both have their place in the interpretation of the ways of God to man. Authority must ever be allowed great weight in the

government of the world, but it must ever be kept in harmony and conformity with reason. A necessity of polity may be held in all churches and governments without holding any one fixed form to be necessary, for these forms are not *natural* but *positive*, and therefore alterable and subject to expediency as interpreted by temperate reason. But the eternal facts of morality are necessary and self-evident postulates of the divine government of the world, and thus rest on verities that cannot be shaken. The whole furnishes a conclusive answer to the Puritan extreme and exaggeration of the central position of Protestantism, the making of Scripture the sole guide of human conduct, which rests and depends rather on the concurrence and co-operation of all the various sources of knowledge that Divine Providence has provided for man. It is not too much to say that it is mainly to Hooker's work that Anglican theology owes the tone and the direction that it has never since entirely lost.

His first book is built on a broad foundation of first principles; his second and third form polemic corollaries to the first; and in the fourth and fifth we have his detailed defence of church discipline and ritual; while the last two contain a defence of its government and its relation to the state. The fifth book is a complete apology for the Anglican Church and its usages, stamped throughout with characteristic breadth and wisdom. Hooker maintains the high religious value of ritual interpreted by the principle of symbolism, and kept in harmony with primitive usage so as to carry with it the weight of undivided authority, yet asserts the right of the living authority within the church itself both to enact and to dispense, in order to avert anarchy and disruption. In his defence of Episcopacy in the seventh book he shelters himself behind no divine right or assumption of formal scriptural authority, but maintains its superiority as a form of church government, both from its undeniable antiquity and its practical utility in actual experience. In his eighth book Hooker discusses the question of the royal supremacy and the mutual relations of church and state. To him, as to Arnold and Stanley, church and state are merely co-extensive terms, and men owe civil duties to the whole community as a state, spiritual duties to it as a church. The royal supremacy is nothing more than the assertion of national unity and independence as against mere sacerdotal pretensions, the whole body politic under its executive head, the crown, being equally concerned in the framing of all laws affecting the church, itself considered but as a part of a greater whole. On this question modern conditions have entirely shifted the bases of discussion, and, whether rightly or wrongly, Hooker's dream of a church and state one and indivisible now seems to Englishmen little more than a devout imagination.

Hooker, THOMAS, one of the founders of Connecticut, was born at Markfield, Leicestershire, in 1586, studied at Cambridge, and became a Fellow of Emmanuel College, and was for four years a curate at Chelmsford. Ejected for nonconformity, he lived in Holland until 1633, when he went to Massachusetts, and received a charge at Cambridge. In 1636 he removed with his congregation to Connecticut, and founded the town of Hartford, where he died, 7th July 1647. Hooker was a man of great influence in New England, and published many sermons and polemical works. A selection, with a Life, was printed at Boston in 1849.

Hooker, SIR WILLIAM JACKSON, a celebrated English botanist, was born at Norwich in 1785. Of independent means from an early age, he devoted himself to natural science. His first work was a *Journal of a Tour in Iceland* in 1811, written from memory, his diaries and collections having been burned. It proved so popular that a second edition was called for in 1813. He married in 1815, and settled first at Halesworth in Suffolk, but was appointed by the crown to the chair of Botany at Glasgow University in 1820. In 1841 he was appointed director of the Royal Gardens at Kew, and his energy and enthusiasm extended it enormously. He was made K.H. in 1836. Already F.R.S. in 1810, he became later D.C.L. of Oxford, LL.D. of Glasgow, and an honorary member of most foreign scientific societies. He exercised much influence in botanical appointments and in naming naturalists to accompany exploring expeditions. His herbarium and his admirable library were given to Kew. He died August 12, 1865. His name survives in Mount Hooker in the Rocky Mountains, and in Hookeria, a natural order of mosses.

His *British Jungermanniæ* (1816); his edition of Curtis's *Flora Londinensis* (1817–28); *Musci Britannici* (1818), in conjunction with Dr T. Taylor; and *Musci Exotici* (1818–20) were his chief early works. Later books were *Exotic Flora* (1822–27); the *British Flora*, with Dr Walker Arnott (1830); *Icones Filicum*, with Dr Greville (1829–31); *Icones Plantarum* (1837–54); *Species Filicum* (1846–64); and *Filices Exoticæ* (1857–59). Yet he found time in his busy life to edit the *Botanical Magazine* (1827–65), the *London Journal of Botany* (1842–48), and the *Journal of Botany and Kew Miscellany* (1849–57).

SIR JOSEPH DALTON HOOKER, son of the preceding, and also an eminent naturalist, was born at Halesworth in Suffolk, June 30, 1817. He was educated at the High School and university of Glasgow, and graduated as M.D. there in 1839. He next joined the antarctic expedition of the *Erebus* and *Terror*, returning after a four years' absence to superintend the publication of his magistral *Flora Antarctica* (1844–47), *Flora Novæ Zelandiæ* (1853–55), and *Flora Tasmaniæ* (1860). He acted for some time as substitute for Professor Graham in the chair of Botany at Edinburgh University, was appointed in 1846 botanist to the Geological Survey of Great Britain, and next year started on a botanical expedition to the Himalayas, which occupied him for three years. His *Himalayan Journals* (1854) contains the narrative of this expedition, and the *Rhododendrons of the Sikkim-Himalaya* (1849–51) illustrates the most remarkable additions which he made to the ornamental plants of our gardens on this occasion. With Dr Thomson of the Calcutta Botanic Gardens he undertook a *Flora Indica* (vol. i. 1855), still a splendid fragment. He published later a flora of British India (1874). In 1871 he made an expedition to Morocco, ascended the Great Atlas, the summit of which had never before been reached by a European, and brought back a valuable collection of plants. His *Tour* appeared in 1878. In 1877 he accompanied Dr Asa Gray in a scientific tour through Colorado, Utah, and California.

Dr Hooker was appointed assistant-director at Kew Gardens in 1855, and on the death of his father in 1865 he succeeded him as director. He succeeded him also in those liberal ideas which have made Kew the real centre of the botanical world. He was president of the British Association meeting at Norwich in 1868, and in his much-debated address professed himself entirely an adherent of Darwin. From 1873 to 1878 he was president of the Royal Society, was made C.B. in 1869 and K.C.S.I. in 1877. He is also LL.D. of Cambridge, Dublin, Edinburgh, and Glasgow, and D.C.L. of Oxford. One of his best-known works is his useful *Students' Flora of the British Islands* (1870); his most important, the *Genera Plantarum*, in conjunction with George Bentham (3 vols. 1862–83). See an article in *Nature* (vol. xvi.).

Hooks and Eyes. These dress-fasteners were used much more largely about 1860 and for some length of time previously than they are now, owing to a change in the fashion of ladies' dresses by which buttons have to a great extent taken their place. Hooks and eyes were formerly made by hand by bending the wire of which they are formed into the proper shape with pliers. But for many years they have been made by machines, which are complex in their details. By one kind of machine the wire is first drawn off a reel, next cut to the required length, then by a sinker forced into a slot by which it is bent, and at the same time the two ends are formed by cams into the lateral loops. This is the process for an eye, but a hook requires an additional bend, and this is produced by another slot and sinker. Makers of these articles do not, however, all use the same kind of machines. See also FISH-HOOKS.

Hoole, JOHN, translator and dramatist, was born at Moorfields, London, in 1727, and at the age of seventeen became a clerk in the East India House, where he remained until 1783. He published translations of the *Jerusalem Delivered* (1763) and *Rinaldo* (1792) of Tasso, the dramas of Metastasio (1767), and the *Orlando Furioso* of Ariosto (1773–83). This last Southey speaks of as 'that vile version of Hoole's,' and Scott describes the translator himself as 'a noble transmuter of gold into lead.' His dramas were *Cyrus* (1768), *Timanthes* (1770), and *Cleonice* (1775)—all of them failures, although Johnson, who was Hoole's friend and spoke well of his verses, praises the last in a complimentary letter. Hoole died 2d April 1803. See *Anecdotes of the Life of John Hoole* (1803).

Hoop Ash. See NETTLE-TREE.

Hooper, JOHN, an English bishop and martyr, was born in Somersetshire about 1495, and educated at Merton College, Oxford, whence in 1518 he passed to a Cistercian monastery at Gloucester. The reading of Zwingli made him a Reformer, and having for some time served as chaplain to Sir Thomas Arundel he twice went, in 1539–40, for safety's sake to the Continent, and after travelling in France and Germany married and settled for three years at Zurich. In 1549 he returned to England, and became a popular preacher in London. In 1550 he was appointed Bishop of Gloucester, and for his difficulty about the oath and his objections to wearing the episcopal habit was imprisoned for some time in the Fleet. His labours as a bishop were incessant, and he wore out nature in devotion to his duty. In 1552 he received the bishopric of Worcester *in commendam*. Next year at the commencement of Mary's reign he was committed to the Fleet, and after eighteen months' imprisonment was tried for heresy and condemned to death. He was burned at the stake at Gloucester, February 9, 1555, his sufferings being much prolonged by the use of green wood. His *Early Writings* were edited by the Rev. Samuel Carr in 1843; his *Later Writings*, by the Rev. Charles Nevinson in 1852, both for the Parker Society.

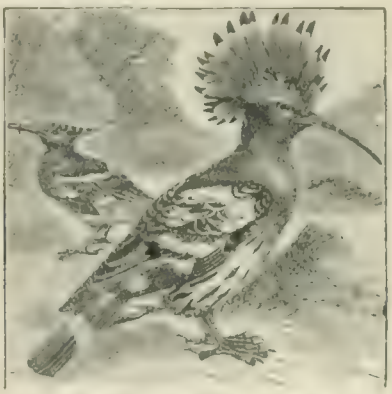
Hooping-cough (or WHOOPING-COUGH; technically, *Pertussis*) is an infectious and epidemic disease, mostly attacking children under ten, especially in spring and autumn. Its earliest symptoms, which usually appear five or six days after exposure to infection, are those of a common cold, as hoarseness, a watery discharge from the eyes and nose, oppression of the chest, a short dry cough, and more or less feverishness. This stage, which is called the *catarrhal*, lasts a week or ten days, when the fever remits, and the cough becomes more troublesome, is worse at night, and occurs in paroxysms consisting of a series of short expiratory puffs followed by a deep inspiration of air through the contracted cleft of the glottis (Larynx, q.v.), causing the characteristic 'whoop.' The attack usually terminates in the expectoration of glairy mucus or in vomiting. During the fit of coughing the face becomes red or livid, the eyes project, and the child seizes some person or object near him for support. These paroxysms occur at uncertain intervals, and between them the child returns to his play, takes his food with good appetite, and exhibits little or no sign of illness. The disease reaches its height at about the end of the fourth week, after which the paroxysms diminish in frequency, and the patient shows signs of improvement. The second stage may last from two to eight weeks, and, if no relapse occur, is succeeded by what may be termed the convalescent stage, the duration of which is very variable.

This is one of those diseases which seldom occur more than once in a lifetime; and hence it probably is that, as few children escape it, it is comparatively rarely noticed in adults. Morbid anatomy has failed to throw any direct light upon its special seat. The proportion of deaths to recoveries has not been satisfactorily determined, but when there is a severe epidemic the mortality due to this disease is often very great, the prospect being worse in the very young and in patients affected with rickets. This mortality is in reality due rather to the bronchitis, pneumonia (or inflammation of the lungs), and convulsions, which are frequent complications of hooping-cough, than to the disease itself.

The treatment of hooping-cough consists in general measures to prevent complications, and in special treatment for shortening the disease and diminishing the violence of the spasms. The child should be kept in the house with the temperature about 60° F., while quiet and the avoidance of excitement must be enforced. The diet should be simple, nutritious, and not too starchy. If the natural vomiting be not sufficient to relieve the chest and stomach of mucus an occasional emetic of ipecacuanha or sulphate of copper must be given. The bowels should be kept moderately open. In the *catarrhal* stage a simple expectorant is all that is needed, but when the whoop is developed give belladonna in large doses. Alkalies are also useful, and bromide of ammonium if nervous symptoms complicate the spasms. As hooping-cough has the characteristics of a germ disease, antiseptic inhalations and sprays seem to offer good ground for hope in shortening the malady. Stimulating liniments such as Roche's Embrocation are useful if the catarrh of the chest is severe, and in the stage of decline alum is of benefit internally. During convalescence nothing is so important as a change of air, while precautions are taken against glandular enlargements by building up the system.

Hoopoe (*Upupa*), a genus of semi-terrestrial insectivorous birds of the family Upupidæ, tribe Tenuirostres, and order Insessores, most nearly related to the Hornbills, but presenting a strong contrast to those ungainly birds by their graceful carriage, elegant figure, and beautiful crest. They are most characteristic of the Ethiopian region, but they are found in central and southern Europe and in Asia as far as Ceylon and Mongolia. The six species are most at home in desert country, where their sand-coloured plumage is a protection to them. The Common Hoopoe (*Upupa epops*) is about a foot long; its plumage exhibits a fine mixture of white, buff, and black; on the tawny-coloured head is an enormous erectile crest, the feathers of which have a black tip beyond a narrow white bar. The plumage of the female is a little paler in colour than that of the male. This bird visits Britain during the spring and autumn migration, but

seldom breeds in any part of the island. The Hoopoe derives its name from the very frequent



Common Hoopoe (*Upupa epops*).

utterance of the sound *hoo hoo hoo* which it produces, puffing out the sides of its neck and hammering on the ground with its bill at each note.

Hoops. See CRINOLINE.

Hoorn, a decaying town and seaport of North Holland, on a bay of the Zuider Zee, 27 miles NNE. of Amsterdam by rail. In the 17th century it had 20,000 inhabitants, and still it is full of antique carved houses; but, like the other 'dead cities of the Zuider Zee,' it has greatly fallen off in prosperity. There is still, however, a trade in butter and cheese. Here the large nets for herring-fishing were invented. Pop. 11,311.

Hoosac Mountain, a part of the Green Mountain range in western Massachusetts, through which is pierced the most notable railway tunnel in America. The Hoosac tunnel, which has a length of very nearly 5 miles, was commenced in 1851 for the line between Boston and Albany, was twice abandoned, and was finally opened in 1875, having cost the state of Massachusetts about $18,000,000. See TUNNEL.

Hoove, or distention of the stomachs, but particularly of the rumen or first stomach, with gas, is a common complaint among cattle and sheep, and results from the eating of food to which the animal has been unaccustomed, from wet clover or vetches, or from any easily fermentable food. Relief generally follows walking exercise, friction on the belly, and a dose of any ordinary stimulant, which for a cow may consist of a couple of ounces of turpentine, whisky, ether, or ginger, to which should also be added, in order to clear the bowels of the offending food, a laxative, such as a pint of oil or a pound of salts. A fourth or fifth of these quantities will suffice for sheep. The introduction of the probang, with the small end downwards, allows the escape of gas when there is little food in the stomach. If simple remedies fail, the breathing becomes distressed and the animal stupid; the gas may with safety be allowed to escape by an external opening made at a point intermediate between the last rib, the lumbar vertebræ, and the prominence of the haunch, either with a canula and trochar or a large pocket or table knife. For several days after an attack of hoove the digestive organs are apt to be easily deranged, and the animal must have soft and digestible food, and an occasional dose of simple laxative medicine.

The horse's bowels when distended with gases are now punctured with the best results.

Hop (*Humulus lupulus*), a perennial dioecious plant of the natural order Cannabinaceæ, the only species of its genus. It has long, rough, twining stems, and stalked 3- to 5-lobed rough leaves, and is a plant of luxuriant growth and abundant foliage. The male flowers grow in loose branching axillary panicles, and consist of five stamens surrounded by a 5-lobed perianth. The female flowers are in *strobiles*, or cones, with large persistent, concave, entire scales, which enlarge as the fruit ripens. The part of the hop so much used in brewing, and sold under the name of hops, is the ripened cone of the female plant. Female plants alone, therefore, are cultivated to any considerable extent, it being enough if a few male plants are scattered over a field.

The hop is first mentioned by Pliny as one of the garden plants of the Romans, who ate the young shoots as we eat asparagus; as, indeed, many country people in England do at the present day. It is a native of Europe and of some parts of Asia, a doubtful native of Britain and of North America. It is extensively cultivated in the south of England, the total area under hops being 66,696 acres in 1880, and 57,724 in 1880 (Kent, 35,487; Sussex, 7282; Hereford, 6850; Worcester, 2939; Hants, 2905; Surrey, 2101, &c.). Hops are also grown to a considerable extent in Germany (116,000 acres), France, Flanders, and southern Russia, and now successfully in the United States (46,800 acres in 1880; about four-fifths in western New York), and in Australia and New Zealand.

The cultivation of the hop was introduced into England from Flanders in the time of Henry VIII., but did not become sufficient for the supply of the kingdom till the end of the 17th century. For some time after hops began to be used in brewing a strong prejudice existed against the innovation;

Hop (*Humulus lupulus*).

and parliament was petitioned against hops, as 'a wicked weed, that would spoil the taste of the drink, and endanger the people.'

The hop requires deep rich soil on a dry bottom, and succeeds best in a sheltered situation with a south or south-west aspect; yet there should be a free circulation of air. The ground is generally well pulverised and manured to a considerable depth by the plough or spade before planting. The plants are usually set in stools of from three to five, a few inches apart, in rows six feet asunder, with the same space between the stools. They are obtained from cuttings or suckers taken from the

healthiest old stools, and are usually planted out somewhat closely in nursing lines for twelve months before being planted permanently. They make very little growth the first year, and not until the third year do they come to full bearing, when from four to six poles from 14 to 18 feet long are required for each stool. The most favoured timber for hop-poles is Spanish chestnut, which is extensively grown in hop-districts as coppice-wood for this purpose. The poles are set to the plants in spring before growth commences, and removed when the stalks are cut away in autumn. The plants are then dressed with manure, and the soil between the stools is stirred lightly with the fork. In Germany the poles are fewer and much taller than in England—from 23 to 27 feet high.

The cones are known to be fit to gather when they acquire a brown amber colour and firm consistence. The stalks are then cut at the base, and removed along with the poles and laid horizontally on frames of wood, to each of which is attached by tenter-hooks a large bag-like cloth into which the hops fall as they are picked by women and children, who are employed in great numbers at this work. When picked the hops are immediately conveyed to the kiln to be dried, as otherwise they are liable to heat and become spoiled in a few hours, especially when they are picked in a moist state. The operation of drying hops is similar to that of drying malt, and the kilns are of the same construction. Great care is required in drying to prevent overheating, by which the essential oil is liable to be volatilised. The hops are spread on hair-cloth from 8 to 12 inches deep, and when the ends of the stalks have become shrivelled and dry they are taken off the kiln, and laid on a wooden floor till they become quite cool, when they are put in bags or pockets.

The produce of no British crop is more precarious than that of the hop. In a good season it may be as much as 20 cwt. per acre, in a bad season none or at most perhaps 2 or 3 cwt. The plant has many enemies, both insect and fungoid parasites, which prey upon it, and destroy the crop season after season. It is calculated that on an average the hop-crop fails every five or seven years. This, in conjunction with the heavy expense of the first formation of a plantation, precludes any but those having considerable capital from taking up its cultivation. But the produce of plentiful years, if properly preserved, may be kept to meet the demand when scarcity may raise the price from £2 or £3 to £20 or £30 per cwt.; consequently to those who can wait few crops are equally profitable.

The best varieties of the hop are the Hill Golding, the East Kent Golding, Golden Hops, Jones's Hops, Grape Hops, and Farnham White Bine. The Goldings are the best and richest. The Jones's are valued for their habit of short growth, requiring shorter poles. The Colegates and Grape Hops are hardy and prolific on poorer soil than any of the others.

The fibre of the stems is employed to some extent in Sweden in the manufacture of a coarse kind of cloth, white and durable; but the fibres are so difficult of separation that the stems require to be steeped in water for a whole winter.

The fruit of the hop is a little nut, not larger than a grain of mustard-seed, and between its outer shell and the kernel there is a small quantity of a peculiar granular substance which also exists as a sort of efflorescence on the surface of the scales themselves; much of the value of the hop depends upon the abundance of this substance. It is not a mere powder, but each grain is a little organised cellular body, of an oval or round form, and, when seen under the microscope, having a reticulated surface. The powder contains some 10 per cent. of *lupuline*, the bitter principle to which hops seem to owe their tonic properties. The oil of hops is sedative, anodyne, and narcotic; the pleasantly aromatic odour has somewhat of the same qualities, hence the value of pillows stuffed with hops in cases of mania, sleeplessness, &c. The bitter principle is not narcotic, but tonic. The oil and bitter principle combine to make hops more useful than camomile, gentian, or any other bitter, in the manufacture of beer; hence the medicinal value of *extra hopped* or *bitter* beer. The tannic acid contained in the strobiles or cones of flowers also adds to the value of hops, particularly as causing the precipitation of vegetable mucilage, and consequently the clearing of beer. *Hop bitters* are used as a tonic. See also BEER.

Until the year 1862 hops paid an excise duty, and formed an important part of the revenue, although a very variable crop, owing to the serious check it is liable to from insects, fungi, diseases, and the weather. Large quantities of hops are imported into the United Kingdom for home use and for exportation to the colonies and other countries. In 1896 hops imported amounted to 207,041 cwt. of a declared value of £591,482. The annual exportation of hops is about 20,000 cwt., chiefly to Australia, Belgium, and the United States.

HOP-FLEA, or TOOTH-LEGGED BEETLE (*Phyllotreta* or *Haltica concinna*), a very small coleopterous insect, not quite one-tenth of an inch long, which often does much mischief in hop-plantations in spring, devouring the tender tops of the young shoots. It is of the same genus as the turnip-fly (*Phyllotreta nemorum*), so destructive to turnips.

HOP-FLY (*Aphis* or *Phorodon humuli*), a species of Aphis (q.v.) or plant-louse, important on account of the injury it inflicts in some seasons on the hop-plantations. The general colour is pale green, as the common name 'green fly' indicates.

Hop Aphis (*Aphis humuli*):
a, *b*, winged viviparous female and stage of larva; *c*, *d*, wingless viviparous female and larva; *e*, larva. (After Miss Ormerod.)

The males, which are winged, appear in autumn, and pair with wingless females. These lay eggs, which develop next spring into swarms of winged females. These produce partheno-genetically and viviparously great numbers of larvæ, 'lice' or 'nits,' which usually remain wingless, but rapidly mature, and soon become the virgin and viviparous parents of fresh swarms. Males and sexual reproduction reappear in autumn. Both larvæ and adults ruin the plants. No efficient method of preventing the ravages of this pest has yet been discovered; but the beneficial service to man of lady-birds and other natural foes of this fly has been long and widely recognised.

Hope, THOMAS, author and connoisseur, was born in London in 1774. While still a youth he travelled over a large portion of Europe, Asia, and Africa, and collected many drawings, chiefly of buildings and sculptures. In England he first attracted attention by the splendid decorations which he bestowed on the interior of his mansion

in Duchess Street, Portland Place, London, a description of which appeared in his book on *Household Furniture* (1805). In 1809 he published *Costume of the Ancients* and *Architecture of Theatres*, in 1812 *Modern Costumes*, and in 1819 (anonymously) *Anastasius, or Memoirs of a Modern Greek at the close of the 18th Century*. This last work is his masterpiece, and by many was ascribed to Lord Byron, who was greatly flattered by the rumour. It is certainly a brilliant and erudite performance; still it wants the dramatic *vis* of a genuine work of genius. Hope died 3d February 1831, leaving behind him a very heterodox but rather eloquent essay *On the Origin and Prospects of Man* (1831), and an *Historical Essay on Architecture* (1835).

His third son, ALEXANDER JAMES BERESFORD-HOPE, born in 1820, was educated at Harrow and Trinity College, Cambridge, where he graduated B.A. in 1841. He was twice Conservative member for Maidstone (1841–52, 1857–59), and for Cambridge University from 1868 till his death on 20th October 1887. In 1880 he was sworn a privy councillor, and in 1881 Dublin University created him an honorary LL.D. A zealous High Churchman, he was the principal founder of St Augustine's missionary college at Canterbury (q.v.), and published several works on church topics, as well as two novels, *Strathy Tod Up* (1880) and *The Brandreths* (1882). He was also a proprietor of the *Saturday Review*.

Hope-Scott, JAMES, third son of the Hon. Sir Alexander Hope, and grandson of the second Earl of Hopetoun, was born at Marlow in 1812, and from Eton proceeded to Christ Church, Oxford. He contented himself with a pass degree (1832), but got a fellowship at Merton; and, called to the bar in 1838, soon made a great parliamentary practice. In 1847 he married Miss Lockhart, on whose succession six years later to Abbotsford he assumed the additional surname of Scott; and in 1851 both he and his wife were admitted into the Roman communion. He died in London, 29th April 1873. His Life by Robert Ornsby (2 vols. 1884) is specially interesting for the glimpses it gives of men like Newman and Gladstone.

Hopital. MICHEL DE L'. See L. HOPITAL.

Hopkins. JUDE. See STEENHOLD.

Hopkins, JOHNS, was born, 19th May 1795, in Anne Arundel county, Maryland, where his parents, Quakers, gave him a fair education and the training of a farmer. At the age of seventeen, however, he went to Baltimore, there became a grocer, and in 1822 founded the house of Hopkins and Brothers. From the grocer's business he retired in 1847 with a large fortune, which he employed in banking and railway operations. In 1873 he gave property worth $4,500,000 to found a free hospital; he presented Baltimore with a public park, and he also gave over $3,000,000 to found the Johns Hopkins University in Baltimore (q.v.). He died December 24, 1873.

Hopkins. MATTHEW. See WITCHCRAFT.

Hopkins, SAMUEL, D.D., born at Waterbury, September 17, 1721, graduated at Yale College in 1741, studied theology with Jonathan Edwards, and from 1743 to 1769 was settled as pastor of Housatonnuc (now Great Barrington), Massachusetts. He then removed to Newport, where he died December 20, 1803. His vritings include a life of President Edwards, sermons, addresses, a treatise on the millennium, and his *System of Doctrines* (1793); these were republished with a memoir by Dr E. A. Park at Boston (3 vols. 1854); and an earlier edition (1805) contains some autobiographical notes. Hopkins, who is said to be the hero of Mrs Beecher Stowe's *Minister's Wooing*, was remarkable for his simplicity, devoutness, and unselfishness. Those who adopt the Hopkinsian theology are not a distinct sect, but are pretty numerous in America, in some of the Christian bodies of which the tenets are generally Calvinistic. They hold most of the Calvinistic doctrines, and even in their most extreme form, but they entirely reject the doctrine of imputation, both the imputation of Adam's sin and of Christ's righteousness. The divine efficiency extends to all acts whatsoever, and sin itself under the guidance of divine providence is merely a necessary means of the greatest good. The fundamental doctrine of the Hopkinsian system, however, is that all virtue and true holiness consist in *disinterested benevolence* (involving unconditional submission), and that all sin is *selfishness*—the self-love which leads a man to give his first regard even to his own eternal interests being condemned as sinful.

Hoppner, JOHN, R.A. (1759–1810), was born at Whitechapel of German parents. At first a chorister in the Chapel Royal, he entered the schools of the Royal Academy in 1775; and under the patronage of the Prince of Wales he became a fashionable portrait-painter and the rival of Lawrence. Elected A.R.A. in 1792 and R.A. in 1795, he has been called 'the plagiarist of Reynolds.' His paintings have suffered from his use of bad mediums; but his repute has risen, and in May 1895 a portrait by him fetched 1800 guineas.

Horace. QUINTUS HORATIUS FLACCUS, Latin poet and satirist, was born near Venusia in southern Italy, on the 8th December 65 B.C. His father was a manumitted slave, who as a collector of taxes or an auctioneer had saved enough money to buy a small estate, and thus belonged to the same class of small Italian freeholders as the parents of Virgil. Apparently Horace was an only child, and as such received an education almost beyond his father's means; who, instead of sending him to school at Venusia, took him to Rome, provided him with the dress and attendance customary among boys of the upper classes, and sent him to the best masters. At seventeen or eighteen he proceeded to Athens, then the chief school of philosophy, and one of the three great schools of oratory, to complete his education; and he was still there when the murder of Julius Cæsar, 15th March 44 B.C., rekindled the flames of civil war. In the autumn of this year Brutus, then proprætor of Macedonia, visited Athens while levying troops. Horace joined his side; and such was the scarcity of Roman officers that, though barely twenty-one and totally without military experience, he was at once given a high commission. He was present at the battle of Philippi, and joined in the general flight that followed the republican defeat; he found his way back to Italy, and apparently was not thought important enough for proscription by the triumvirate. His property, however, had been confiscated, and he found employment in the lower grade of the civil service to gain a livelihood. It was at this period that poverty, he says, drove him to make verses. His earliest were chiefly social satires and personal lampoons; but it was probably from some of his first lyrical pieces, in which he showed a new mastery of the Roman language, that he became known to Varius and Virgil, who in or about 38 B.C. introduced him to Mæcenas, the confidential minister of Octavianus, and a munificent patron of art and letters. The friendship thus formed was uninterrupted till the death of Mæcenas, to whose liberality Horace owed release from business and the gift of the celebrated farm among the Sabine hills. From this time forward his life was without marked incident. His springs and summers were generally spent at

Rome, where he enjoyed the intimacy of nearly all the most prominent men of the time, his autumns at the Sabine farm or a small villa which he possessed at Tibur; he sometimes passed the winter in the milder seaside air of Baiæ. Mæcenas introduced him to Augustus, who, according to Suetonius, offered him a place in his own household, which the poet prudently declined. But as the unrivalled lyric poet of the time Horace gradually acquired the position of poet-laureate; and his ode written to command for the celebration of the Secular Games in 17 B.C., with the official odes which followed it on the victories of Tiberius and Drusus, and on the glories of the Augustan age, mark the highest level which this kind of poetry has reached. On the 27th November 8 B.C. he died in his fifty-seventh year. Virgil had died eleven years before; Tibullus and Propertius soon after Virgil; Ovid, still a young man, was the only considerable poet whom he left behind; and with his death the great Augustan age of Latin poetry ends.

The following is the list of Horace's works, arranged according to the dates which have been most plausibly fixed by scholars. Some of the questions of Horatian chronology, however, are still at issue, and to most of the dates now to be given the word 'about' should be prefixed.

The first book of *Satires*, ten in number, his earliest publication, appeared 35 B.C. A second volume of eight satires, showing more maturity and finish than the first, was published 30 B.C.; and about the same time the small collection of lyrics in iambic and composite metres imitated from the Greek of Archilochus, which is known as the *Epodes*. In 19 B.C., at the age of forty-six, he produced his greatest work, three books of *Odes*, a small volume which represents the long labour of years, and which placed him at once in the front rank of poets. About the same time, whether before or after remains uncertain, is to be placed his incomparable volume of *Epistles*, which in grace, ease, good sense, and wit mark as high a level as the *Odes* do in terseness, melody, and exquisite finish. These two works are Horace's great achievement. The remainder of his writings demand but brief notice. They are the *Carmen Seculare* already noticed; a fourth book of *Odes*, with all the perfection in style of the others, but showing a slight decline in freshness; and three more epistles, one, that addressed to Florus, the most charming in its lively and graceful ease of all Horace's familiar writings; the other two somewhat fragmentary essays in literary criticism. One of them, generally known as the *Ars Poetica*, was perhaps left unfinished at his death.

In his youth Horace had been an aristocrat, but his choice of sides was perhaps more the result of accident and association than of conviction, and he afterwards acquiesced without great difficulty in the imperial government. His acquiescence was not at first untempered with regret; and in the *Odes* modern critics have found touches of veiled sarcasm against the new monarchy, and even a certain sympathy with the abortive conspiracy of Murena in 22 B.C. But as the empire grew stronger and the advantages which it brought became more evident—the repair of the destruction caused by the civil wars, the organisation of government, the development of agriculture and commerce, the establishment at home and abroad of the peace of Rome—his tone passes into real enthusiasm for the new order.

Horace professed himself a follower of the doctrines of Epicurus, which he took as a reasonable mean between the harshness of Stoicism and the low morality of the Cyrenaics. In his *Odes*, especially those written on public occasions, he uses, as all public men did, the language of the national religion. But both in religion and in philosophy he remains before all things a man of the world; his satire is more of manners and follies than of vice or impiety; and his excellent sense keeps him always to that 'golden mean' in which he sums up the lesson of Epicurus. As a critic he shows the same general good sense, but his criticisms do not profess to be original or to go much beneath the surface. In Greek literature he follows Alexandrian taste; in Latin he represents the tendency of his age to undervalue the earlier efforts of the native genius, and lay great stress on the technical finish of his own day.

From his own lifetime till now Horace has had a popularity unexampled in literature. A hundred generations who have learned him as schoolboys have remembered and returned to him in mature age as to a personal friend. He is one of those rare examples, like Julius Cæsar in politics, of genius which ripens late, and leaves the more enduring traces. Up to the age of thirty-five his work is still crude and tentative; afterwards it is characterised by a jewel-finish, an exquisite sense of language which weighs every word accurately and makes every word inevitable and perfect. He was not a profound thinker; his philosophy is that rather of the market-place than of the schools; he does not move among high ideals or subtle emotions. The romantic note which makes Virgil so magical and prophetic a figure at that turning-point of the world's history has no place in Horace; to gain a universal audience he offers nothing more and nothing less than what is universal to mankind. Of the common range of thought and feeling he is perfect and absolute master; and in the graver passages of the *Epistles*, as in the sad and noble cadence of his most famous *Odes*, the melancholy temper which underlay his quick and bright humour touches the deepest springs of human nature. Of his style the most perfect criticism was given in the next generation by a single phrase, *Horatii curiosa felicitas;* of no poet can it be more truly said, in the phrase of the Greek dramatist Agathon, that 'skill has an affection for luck, and luck for skill.' His poetry supplies more phrases which have become proverbial than the rest of Latin literature put together. To suggest a parallel in English literature we must unite in thought the excellences of Pope and Gray with the easy wit and cultured grace of Addison.

Horace's historical position in Latin literature is this: on the one hand he carried on and perfected the native Roman growth, satire, from the ruder essays of Lucilius, so as to make Roman life from day to day, in city and country, live anew under his pen; on the other he naturalised the metres and manner of the great Greek lyric poets from Alcæus and Sappho downwards. Before Horace Latin lyric poetry is represented almost wholly by the brilliant but technically immature poems of Catullus; after him it ceases to exist. For what he made it he claims, in a studied modesty of phrase but with a just sense of his own merits, an immortality to rival that of Rome.

EDITIONS: Horace's works are believed to have been printed for the first time in 1470 at Milan. The most important commentaries (with Latin notes) are those of Denis Lambin (1561), Bentley (1711), and Orelli and Baiter (1850-52). For ordinary students, with English notes, the most useful editions are by Macleane (1853), Yonge (1867), Wickham (vol. i. *Odes* and *Epodes*, 1874), Wilkins (*Epistles*, 1885) and Palmer (*Satires*, 1885). TRANSLATIONS: Francis, Conington (the whole), Sir Theodore Martin (*Odes* and *Satires*), Rutherfurd Clark (*Odes*). The *Life of Horace*, by Dean Milman, and Sir T. Martin's book (1870) in the 'Ancient Classics for English Readers' may also be read with advantage.

Horatii, the three brothers selected by Tullus Hostilius, king of Rome, to fight against the three brothers Curiatii, the champions of Alba Longa, when it was agreed to decide the quarrel between the two cities by the issue of single combat by three warriors chosen from either side. The legend goes that two of the Horatii were speedily slain; the remaining brother, yet unscathed, by a simulated flight, succeeded in engaging each of his wounded opponents singly, and in overcoming them all. As he entered the gate of Rome in triumph, bearing the trophies of the slain, he was met by his sister, whose beloved was one of the dead champions of Alba. She cursed his slayer, her victorious brother, and was by him thereupon stabbed to the heart. Horatius, condemned by the *duumviri* to be scourged to death, was afterwards saved by the people, and lived to destroy Alba Longa and carry its inhabitants to Rome. This story, although containing a very large admixture of mythical elements, points to the close relationship that existed between Rome and Alba Longa, as well as to the fact of an internecine struggle having taken place before the latter was incorporated in the political organisation of the former.

It was a descendant of the survivor of the three Horatii, named Horatius Cocles, who in 507 B.C., along with Titus Herminius and Spurius Lartius, formed the 'dauntless three,' who 'kept the bridge so well in the brave days of old,' against the army of Lars Porsena, king of Larium, whilst their compatriots broke down the Sublician bridge behind them. Horatius escaped by swimming the 'yellow Tiber,' was received with jubilant shouts by his fellow-citizens, and overwhelmed with honours and rewards.

Horbury, a village of the West Riding of Yorkshire, 4 miles SW. of Wakefield, manufactures woollens, worsteds, flannels, &c. Pop. 5550.

Hörde, a town of Westphalia, 2½ miles SE. of Dortmund, has large ironworks (employing more than 4000 men) and coal-mines, with iron, steel, and zinc manufactories. Pop. 16,598.

Hordein, a term that has been applied to a substance that can be extracted from barley (Lat. *hordeum*), which is merely a mixture of starch, cellulose, and a somewhat nitrogenous matter.

Common Hoarhound (*Marrubium vulgare*).

Horeb. See SINAI.

Horehound (*Marrubium*), a genus of plants of the natural order Labiatæ, having a tubular 10-ribbed calyx, with 5 or 10 spiny equal teeth, 4 stamens included in the corolla, the upper lip of the corolla erect, the lower lip 3-cleft. The species are mostly perennial, herbaceous plants, natives of the south of Europe and the East. One species, the Common or White Horehound *M. vulgare*, is a rather rare native of Britain, and is found generally throughout Europe, except in the more northern regions, growing in waste places, waysides, &c. It is frequently cultivated in gardens among collections of herbs. It is about 1 to 1½ feet high, bushy, with roundish, ovate, crenate, wrinkled leaves, and almost globose whorls of white flowers. The whole plant has a whitish appearance, from the down with which its leaves are covered. It has an aromatic but not very agreeable smell. It is tonic, stimulant, and laxative, and is much used in coughs, being a popular remedy, and a very safe and efficacious one. It was formerly also employed in affections of the womb and of the liver. It is administered in the form of an infusion, or made into a syrup with sugar, and sometimes the syrup is candied. Black Horehound is the popular name of *Ballota nigra*, another native of Britain, and belonging to the same natural order. For Water Horehound, see GYPSY-WORT.

Horizon, the circular line formed by the apparent meeting of the earth and sky; this, in astronomy, is *sensible horizon*. The *rational horizon* is the circle formed by a plane passing through the centre of the earth, parallel to the sensible horizon, and produced to meet the heavens. The *artificial horizon* is a small trough containing quicksilver, the surface of which affords a reflection of the celestial bodies. It may be used for calculating the altitude of the stars when the sea-horizon is obscured by fog or otherwise not available to the sailor determining his position. The *dip of the horizon* is the angle through which the sea-horizon appears depressed in consequence of the elevation of the spectator. The true dip of the horizon, however, is not exactly the same as its apparent depression. The apparent sea-horizon is raised above its true place by *refraction* through an angle which varies according to the state of the atmosphere and the relative temperatures of the air and water, the variation ranging from one-third to one-twenty-third of the amount of the true dip. The rule commonly employed is to diminish the true dip by about one-fourteenth of its amount to find the apparent dip.

Hormayr, JOSEPH, FREIHERR VON, historian, was born at Innsbruck, 20th January 1782. In 1803 he was appointed keeper of the state and royal archives of Austria, and in 1816 imperial historiographer. But, having conceived an unconquerable hatred of Metternich, who had caused him to be imprisoned for thirteen months upon suspicion of being concerned in a new revolt in Tyrol, Hormayr in 1828 entered the service of Bavaria, and, after four years' activity in the department for foreign affairs, was nominated minister of Bavaria to Hanover from 1832, and to the Hanse towns from 1837. From 1846 to his death on 5th October 1848 he was head of the Bavarian archives. He published several works on the history of Tyrol (including *Das Land Tirol*, 1845), an 'Austrian Plutarch,' and a general history of modern times.

Horn, a general term applied (1) to certain structures, whatever their composition, growing on the heads of oxen, sheep, giraffes, rhinoceroses, &c., and to similar structures on other animals such as beetles; (2) to a substance of a certain definite chemical composition forming 'horns,' hoofs, nails, claws, and other similar structures.

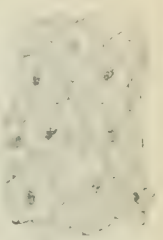
(1) Of horns as they exist among mammals there are two distinct classes: (*a*) horns formed of epidermal tissue; and (*b*) bony horns or antlers. (*a*) Epidermal horns are of two kinds. The horn of the rhinoceros, which is an example of the first kind, consists of a compact, uniform agglutination of epidermal fibres or bristles. The slightly concave base of the horn fits over a slightly-projecting roughened portion of the nasal bones underneath. In the growing horn, while the fibres at the back decay, new fibres are so added at the front and sides that, relatively to the fore-part of the head, the position of the horn remains always the same. In grown animals new material is added only at

the base, and the whole outer surface is smooth and rounded. The horn is median in position and symmetrical in shape. In the female it is usually shorter and smaller. When a second horn is present it is usually shorter and smaller in size, and is situated behind the first one and on the frontal bones. If we imagine the rough part of the bone underneath and the vascular tissue immediately over it growing upwards into the epidermal horn and hollowing it out, we have the second kind of epidermal horn—the hollow horn found in the Cavicornia (Bovidæ, Ovidæ, Antilopidæ). In the case of these horns the bony part, or horn core, is developed as an outgrowth from the frontal bone; in the Bovidæ and Ovidæ the cores are hollow or spongy, and their spaces communicate with the air-spaces in the frontal bones, while in the Antilopidæ the cores are solid or only slightly excavated at the base. Hollow horns are usually unbranched and persistent, but in the Prong-horn Antelope (*Antilocapra americana*) the horny sheaths are shed annually while the bony cores grow and their vascular coverings persist and give rise to the new horns; these horns show, after the first year, a small branch or snag analogous to the brow-antler of the deer. In the Chickara (*Antilope* [*Tetraceros*] *quadricornis*), an Indian species of antelope, two pairs of horn cores are developed from the frontal bones. The gigantic extinct antelopes Bramatherium and Sivatherium had two pairs of horns like the *Antilope quadricornis*, and the hinder pair possessed the branched character now exhibited only by the Prong-horn. Hollow horns are found usually in both sexes, but

Front View of the Skull of the Ox, with the right Horny Sheath detached from the Core.

in some genera of antelopes (Tragelaphus, Cervicapra, Cephalophus, &c.) only in the male. In the Prong-horn the horns of the female are almost hidden in the hair of the head; they are small, short, and unbranched, as in the yearling buck. (*b*) Bony horns or antlers (see ANTLERS, and DEER) are of two kinds, exemplified by the horns of the deer and giraffe respectively. In these the horns are developed from membrane bones which grow up covered by the skin, and nourished by vessels from it. In the giraffe they grow just over the junction of the frontal with the parietal bones, and become united to them by means of cartilage. The integument over the antler is terminated by a tuft of coarser hair, and is persistent. Horns are present in both sexes, and the young giraffe is the only animal born with horns. The antlers of the deer differ from those of the giraffe in that the membrane bones become firmly united by bony growth to the frontal bones, the integument—or velvet—does not persist, and the horns are shed annually.

(2) True horny tissue is a modified form of epidermic tissue. The term includes not only true horn, as noted above, but also hoofs, nails, claws, hair, wool, beaks of animals generally, the carapace of tortoises, the scales of the pangolin, the spines of the hedgehog and the quills of the porcupine, the feathers of birds, the 'castors' of horses and other animals, and other epidermic thickenings and growths, whether occurring normally as the callosities over the breastbone of camels and the hips of some monkeys or pathologically as the 'corns' and 'horns' of the human subject. This tissue largely consists of an albuminoid substance termed 'keratin,' which is composed of carbon (from 50·3 to 52·5 per cent.), hydrogen (from 6·4 to 7 per cent.), oxygen (from 20·7 to 25 per cent.), nitrogen (from 16·2 to 17·7 per cent.), and sulphur (from ·7 to 5 per cent.). Keratin may be obtained from the structures above enumerated by the successive action of boiling water, alcohol, ether, and dilute acids, and is probably a compound body that has not yet been resolved into its components. Viewed under the microscope, horny tissue is seen to consist of numerous parallel bundles of fine threads. These threads, under the action of a concentrated solution of caustic potash or soda, unfold into small plates which gradually expand into regular nucleated epidermic cells shown in the figure.



Cellular Structure of Horn.

Cattle are frequently dishorned to prevent them from constantly goring and injuring each other when confined in open courts; the whole or part only of the horn and horn core may be removed, but the usual method is total dishorning by sawing off the horns close to the head, at their junction with the skull. If the operation is skilfully performed, and if proper precautions be taken to prevent inflammation following, the operation is affirmed by many to be by no means a very painful one (much less so than many others, such as branding), the skin being the most sensitive structure involved. It should not therefore, it is argued, be considered within the category of cruelty to animals forbidden by law. In 1889, however, the Queen's Bench division decided against this view, the judges denouncing the practice as cruel and demoralising. The Scottish Court of Session in 1890 came to an opposite conclusion, which was appealed from.

HORN MANUFACTURES.—The horns of the ox, buffalo, sheep, goat, and antelope are hollow, tough, and capable of being split into flexible slices. Rhinoceros horn, though solid through nearly its whole length, resembles that of the ox in its nature. From the most remote ages the horns of animals have been employed by man for various purposes. Numerous examples of poniards, handles, pick-axes, dart-heads, 'batons of authority,' and implements of unknown use made of reindeer and red-deer horns have been found in river-gravels among other prehistoric remains of the Neolithic period. But the most remarkable of the productions of Neolithic man which have yet been found are pieces of reindeer horn and mammoth tusks with carvings or etchings of animals upon them.

Horns of the ox, as well as those of the sheep and goat, can be split up into sheets or plates after they have been soaked and boiled. When made very thin such plates were at one time used for window-panes, for the construction of lanterns, and for covering Hornbooks (q.v.). Two pieces of horn can also be welded together at the edges by steeping them in hot water and applying pressure. Another valuable property of horn is that when heated it can be pressed into a die or mould. In this way it is formed into ornamental handles for knives, forks, umbrellas, and walking-canes; also into drawer-knobs, spoons, boxes, buttons, and many other useful articles. The manufacture of combs from horn is already described under COMB.

It may be stated here that the hoofs of oxen are likewise manufactured on a large scale into combs, and to some extent into other articles such as buttons.

In their natural form, but cleaned and polished, horns are used as drinking-cups and snuff-boxes, and in past times they were very largely employed for holding gunpowder. They also served as wind-instruments. Many of the Scotch powder-horns in use during the 16th and 17th centuries are beautifully and elaborately carved. A considerable number of these are illustrated in Drummond's *Ancient Scottish Weapons* (1881). In India buffalo and other horns are used for ornamental work of various kinds. Rhinoceros horn again is a favourite material with Chinese carvers, who form the base of it into elegant cups, and sometimes make a very effective ornament of the entire horn, which admits of being very boldly carved. The deer horn so much worked up at Sheffield into handles for carving and pocket knives is chiefly that of the Axis deer (*Cervus axis*) of India. Deer horns are employed in France and Germany to decorate furniture. In Great Britain the antlers or horns of the stag, the roe, and the fallow deer—generally with the skull attached—are favourite ornaments for the decoration of entrance-halls.

The average annual imports of horns and hoofs into Great Britain at the close of the 19th century amounted to 5000 tons, valued at more than £150,000. To show the size to which some horns attain, a pair on a Cape ox measures 9 or 10 feet from tip to tip. The horns of a large-sized Indian buffalo, though curved, are about as long. They are 8 or 9 inches broad at the base, and a single horn may weigh 11 or 12 lb. See Rowland Ward's *Horns and Measurements of the Great Game of the World* (1892).

Horn, Cape, commonly spoken of as the southernmost point of America, is a steep, black, bare mountain-headland of one of the small islands of the Fuegian Archipelago, 55° 59′ S. lat., 67° 14′ W. long. It was named Hoorn, anglicised Horn, when rounded in 1616 by the Dutch navigators, Lemaire and Schouten. It was sighted by Drake in 1578. Steamers can avoid the dangerous doubling of 'the Horn' by the Strait of Magellan. See Spears, *The Gold Diggings of Cape Horn* (1896).

Horn, Count (1518–68). See Egmont, and Holland *Historic*.

Horn, French (Fr. *cor*, *cor de chasse*; Ital. *corno*, *corno da caccia*; Ger. *horn*, *waldhorn*), one of the most important, as it is the softest toned, of brass instruments used in orchestral music. Its soft and peculiar tone is due to the length of the tube, the shape of the bell, and the funnel-like bore of the mouthpiece. This latter important point will be understood from fig. 1, which shows a section of the horn mouthpiece (*a*) contrasted with that of the trumpet (*b*), the most brazen of brass instruments. The original French horn was used in hunting, and consisted of a long tube with two or three turns made large enough to go over the shoulders of the hunter. It was used from a very early period, but it was Louis XV. who composed the complete set of sounds and fanfares still used in the French hunting-field.

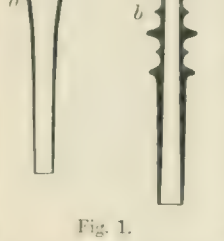
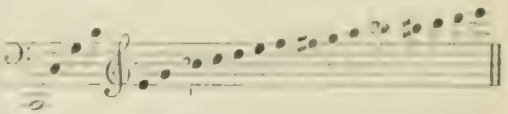


Fig. 1.

It was introduced into the orchestra in the early part of the 18th century, and it gradually acquired the important position it now holds from the smooth softness of its tones as a foundation for harmony in chords, and its fine contrast with other instruments.

For orchestral purposes the instrument was improved by the addition of crooks of varying lengths, so as to pitch it in different keys; and thus horn music is always written in C with the key added to show the crook to be used. These crooks are usually eight in number, and extend from A♯ in alto to C basso; the lowest crook making the total length of the instrument a little over 16 feet. There are also tuning crooks, raising or lowering either of the others a semitone, and also a tuning slide for the more accurate tuning with the other instruments. The open notes of the horn are the harmonics of its fundamental note (see Harmonics), and as this, from the length of the tube, is very low, the harmonics in the middle scale are at very short intervals with many consecutive notes. It may be given approximately thus:



The notes actually sounded, of course, depend on the crooks used. The method of forming the intermediate notes by hand-stopping was discovered by a player named Hampl at Dresden about 1770. The open hand, with the fingers close together, is introduced into the bell, lowering the pitch a semitone. These stopped notes, however, have a muffled sound, and in modern times the horn is almost always made with two or three valves to bridge over the intervals. Fig. 2 shows the horn

Fig. 2.

with two valves as commonly used. On account of the frequent changes of pitch, and the number and tenderness of its open notes, it is a difficult instrument to play. The horn is very seldom used singly; either two or four being the usual number in the orchestra.

Handel, Mozart, Beethoven, Schubert, Weber, Mendelssohn, Rossini, Schumann, and all composers of note have given the horns a most important place in their works. See article 'Horn' in Grove's *Dictionary of Music*.

Posthorn, a straight brass or copper instrument, varying from 2 to 4 feet in length, and somewhat resembling the bugle in its taper bore; it has a small cupped mouthpiece. It was used as a signal instrument by the guards of mail-coaches, but has occasionally been introduced into light music. It has the same open notes as the Bugle (q.v.). The hunting-horn, used in England, is a shorter instrument of the same kind. The Saxhorn (q.v.) is a different instrument.

Hornbeam (*Carpinus*), a genus of the natural order Amentaceæ, consisting of trees with compact, tough, hard wood; bark almost smooth and of a whitish-gray colour, deciduous leaves, and monœcious flowers. The male catkins are cylindrical and sessile; their flowers consist merely of a little scale-like bract and twelve to twenty-four stamens. The female catkins are slender, several inches long when in fruit, and conspicuous for their long leaf-like bracts, and containing small, ovoid, prominently

Common Hornbeam (*Carpinus betulus*):
a, male catkin; *b*, female catkin, fully developed; *c*, fruit.

ribbed nuts. The flowers appear in spring as the leaves come out. Such are the characteristics of the Common Hornbeam (*Carpinus betulus*), which is believed to be indigenous to Britain, but is best known as a plantation tree. It has a wide range of distribution on the continent of Europe.

The tree attains a height of from 30 to 80 feet—rarely the latter. The wood is white, very compact, hard, and tough, but does not now rank high commercially. It is occasionally used by joiners, turners, and wheelwrights, but, being capable of receiving a fine polish, is more in demand for purposes of ornament than utility. It was formerly in Britain, and is yet in many parts of Europe, preferred for making yokes for cattle—hence, according to some authorities, the name hornbeam. It is one of the best of firewoods, and, the leaves, like those of the beech, being persistent in winter, it is employed as a hedge plant for purposes of shelter. There are a very few other species of Carpinus natives of Europe, Asia, and North America, differing chiefly in the size and shape of the fruiting bracts.

Hornbill, the name of a genus (Buceros) and of a family (Bucerotidæ) of birds now placed in the division of Fissirostral Picarian birds. The species are numerous, and are found in Africa, India, and throughout the Malayan region as far as New Guinea. They are mostly large birds, the largest being more than 4 feet long, the smallest rather smaller than a magpie. They are bulky birds of heavy, noisy flight; their large bills are surmounted by bony crests or helmets of varied shape and sometimes of great size, but rendered light by the presence of numerous air-cells. Their food is principally fruits, but in certain circumstances they become to a great extent omnivorous. The most curious fact regarding these birds is that during the breeding season the male imprisons the female in the nest in a hollow tree, plastering up the entrance, and leaving only a small slit through which he supplies her and her offspring with food until the young ones are nearly full grown. In captivity the male bird has been observed to disgorge at intervals the lining of his gizzard in the form of a bag, and it is supposed that the food supplied to the female during her term of captivity in the breeding season is enclosed in this structure.

Hornbill (*Buceros rhinoceros*).

Hornblende, an important rock-forming mineral, having much the same composition as augite. It is considered to be an isomorphous mixture of silicate of magnesia and lime and silicate of iron and lime, combined with an aluminous silicate of lime and magnesia. It crystallises in monoclinic forms; has a hardness = 5·5 to 6; and specific gravity = 3·1 to 3·3. There are two tolerably well-marked varieties—viz. *common hornblende* and *basaltic hornblende*. Common hornblende is dark-green to raven-black, and is characteristic of many crystalline schists and plutonic rocks. It generally takes the form of long prismatic crystals, but is sometimes massive, fibrous, and radiating. Basaltic hornblende is generally brownish-black to pitch-black, and the crystals are usually short and well formed. It occurs as a primary constituent of many eruptive rocks. *Smaragdite* is a peculiar grass-green lamellar form of hornblende, characteristic of the rock Eclogite.

Hornbook, the primer or apparatus for learning the elements of reading, used in England before the days of printing, and common down to the time of George II. It consisted of a single leaf, containing on one side the alphabet large and small, in black letter or in Roman, with perhaps a small regiment of monosyllables. Then followed a form of exorcism and the Lord's Prayer, and as a finale, the Roman numerals. The leaf was usually set in a frame of wood, with a slice of transparent horn in front—hence the name of *horn*-book. There was a handle to hold it by, and usually this handle had a hole for a string, whereby the apparatus was slung to the girdle of the scholar. Sometimes the leaf was simply pasted against a slice of horn. At first the leaf was of vellum, with the characters in writing; latterly, of paper, and printed. The hornbook was prefaced and otherwise ornamented with figures of the cross, and hence came to be often called Christ Cross Row, or Criss Cross Row. Common as hornbooks at one time were, copies of them are now exceedingly rare. See the elaborate monograph by A. W. Tuer, the *History of the Horn Book*, with illustrations and fac-similes (2 vols. 1896); and Halliwell's *Fugitive Tracts* (1849). Allusions to the hornbook abound in the older writers; thus Shenstone, in his *Schoolmistress*, tells us of the children, how

> [illegible] small they take in hand,
> Which with pellucid horn secured are,
> To save from fingers wet the letters fair.

Horncastle, an ancient market-town of Lincolnshire, at the foot of the Wolds, between the confluent Bain and Waring, 21 miles E. of Lincoln,

with which it is connected by a branch line (1855). It has a handsome Perpendicular church restored 1861, a corn exchange (1856), a grammar school (1562), and a great August horse fair, to which Borrow devotes eleven chapters of the *Romany Rye*. Roman remains have been found here, and in the neighbourhood are Scrivelsby, long the seat of the Dymokes, champions of England; Winceby, the scene of a Royalist defeat (1643); Woodhall Spa, with a salt spring discovered in 1820; and the site of the Cistercian abbey of Revesby (1142). Pop. (1841) 4921; (1891) 4374. See Weir's *History of Horncastle* (1820).

Horne, Richard Henry 'Hengist,' a bright and vigorous writer, born on New year's Day 1803. He was educated at Sandhurst, but from love of adventure found his way into the Mexican naval service, and took his share in all the fighting that was going at Vera Cruz, San Juan Ulloa, and elsewhere. After passing through perils of all kinds, from yellow fever, sharks, broken ribs, shipwreck, mutiny, and fire, he reached England in safety, and plunged into a busy life of letters, writing poetry and prose alternately and with equal excellence. His famous epic *Orion* he published at the price of one farthing in 1843, to show his contempt for a public that would not buy poetry. In 1852 he went to Australia to dig for gold, and quickly became a person of consequence in the colony of Victoria; but he returned to England in 1869, dissatisfied with the government's failure to implement its obligations. He maintained the same incessant activity almost up to the close of life, his iron constitution braced by the swimming and athletic feats in which since boyhood he had been foremost. He died 13th March 1884. Among his books may be named *Exposition of the False Medium and Barriers excluding Men of Genius from the Public* (1833), *A New Spirit of the Age* (1844), in which he was helped by E. B. Browning; and *Australian Facts and Prospects* (1859); two tragedies, *Cosmo de' Medici* (1837) and *The Death of Marlowe* (1837); *Judas Iscariot, a Miracle Play* (1848); and *The Dreamer and the Worker* (1851). Mrs Browning's letters to him were collected in 1877. He took the name Hengist when in Australia.

Horne, Thomas Hartwell, biblical critic, born October 20, 1780, was educated at Christ's Hospital, and afterwards became clerk to a barrister. His leisure hours were devoted to the study of the Bible, and in 1818 he published his *Introduction to the Critical Study and Knowledge of the Holy Scriptures*, a work which procured for him admission into orders without the usual preliminaries. Subsequently, St John's College, Cambridge, granted him the degree of B.D., and the University of Pennsylvania that of D.D. In 1833 he obtained a rectory in London; and he was also made a prebendary of St Paul's Cathedral. In the course of a long life Horne published a large number of theological works, and died 27th June 1860. The *Introduction* became a very popular authority and passed through many editions: an important one was that edited in 1856 by Dr Samuel Davidson (q.v.). See the *Reminiscences of T. H. Horne*, by his daughter (1862).

Horned Screamer. See Screamer.

Horned Toad, also called Horned Frog and Horned Lizard (*Phrynosoma cornutum*), is really a lizard belonging to the Agamidæ (q.v.). It is found in Mexico, Texas, Oregon, and California.

Horned Viper. See Cerastes.

Hornellsville, a town of New York, 91 miles SE. of Buffalo by rail, with railway workshops, and manufactures of mowing machines, stoves, &c. Pop. 10,966.

Horner, Francis, was born at Edinburgh, 29th August 1778, a merchant's son of mixed English and Scottish ancestry. From the High School he passed at fourteen to the university, and, after three years there, spent two more with a clergyman in Middlesex, there to 'unlearn' his broad native dialect. On his return (1797) he was called to the Scottish bar, from which in 1802 he removed to the English; and in 1806 entered parliament as Whig member for St Ives. He had made his mark in the House as a political economist, when, at the early age of thirty-eight, he died of consumption at Pisa, 8th February 1817. There is a statue of him by Chantrey in Westminster Abbey; but himself he left little to preserve his name, beyond some contributions to the *Edinburgh Review* (q.v.), of which he was one of the founders. Yet, in Lord Cockburn's words, he was 'possessed of greater public influence than any other private man, and admired, beloved, trusted, and deplored by all except the heartless or the base.' And this, he explains, was due, not to rank, wealth, office, talents, eloquence, or fascination of manner, but merely to 'sense, industry, good principles, and a good heart—to force of character.' See *Horner's Memoir and Correspondence* (2 vols. 1843), and Cockburn's *Memorials of his Time* (1856).

Hornet (*Vespa crabro*), the largest species of wasp found in Britain. It is not uncommon in some parts of England, but is not found in Scotland. It measures about an inch in length, and is predominantly brown or brownish-red, with some yellow on head, abdomen, and wings. The insects lick the sap of trees and are very partial to sweet things, such as fruit, the secretion of aphides, &c. At times, however, they are markedly carnivorous. The females have formidable retractile stings. The nest, which is built in a hollow tree, in an outhouse, or in some other sheltered place, is composed of a coarse papery material manufactured from bark. The community of males, females, and workers is not supposed ever to include more than about 200 individuals, all of them the offspring of a single female, which, having survived the winter in some sheltered hiding-place, laid the foundation of her nest in spring. The hornet is common throughout Europe, and is represented in the United States by the Whitefaced Hornet (*V. maculata*), also a large species. See Wasp.

Hornet (*Vespa crabro*).

Horning, in Scots law. See Execution.

Hornpipe is the name of an English dance, probably named after an obsolete musical instrument. Many popular hornpipes are familiar, such as the College hornpipe, &c. Those best known are in common time.

Horn-Silver. See Silver, Photography.

Hornstone, an impure variety of flint, with a very splintery fracture.

Horn-work, in Fortification, is a capacious form of advanced work formerly much used. The head is a bastioned front, and therefore self flanking, while the sides or branches are flanked from the works in rear. If, instead of a single bastioned front, the work has two bastioned fronts, it is called a *Crown-work* (q.v.), and if three, a *counter crown-*

work. The position of these works is outside the glacis. There were good examples in the old fortifications of Strasburg. See also FORTIFICATION.

Horodenka, a town of Austria in East Galicia, 106 miles SE. of Lemberg. Pop. 10,226.

Horology (Lat. *horologium*, Gr. *horologion*, 'a sun-dial,' 'a water-clock;' Gr. *hora*, 'a season,' 'an hour,' and *-logion*, from *legein*, 'to tell;' compare Old Eng. *horologe*, Fr. *horloge*, 'a clock'), the science which treats of the construction of machines for telling the time. Although it is easy to look back to a period when time, according to the modern conception of it, as measured by hours and minutes and seconds, was unknown, yet we find progress early made in the measurement of larger periods of time, by observations of the heavenly bodies. Thus, time was early divided into years according to the apparent motion of the sun among the constellations; into months by the revolution of the moon round the earth; and into days by the alternate light and darkness caused by the rising and setting of the sun. It was long, however, before any accurate measure was found for a division of the day itself. The earliest measure employed for this purpose that we can trace is the shadow of an upright object, which gave a rough measure of time by the variations in its length and position. This suggested the invention of sun-dials (see DIAL). Another means early adopted for the measurement of short periods of time was by noting the quantity of water discharged through a small orifice in the containing vessel. Instruments for the measurement of time on this principle were called Clepsydræ (q.v.). The running of fine sand from one vessel into another was found to afford a still more certain measure, and hence the invention of the Hour-glass (q.v.). King Alfred is said to have observed the lapse of time by noting the gradual shortening of a lighted candle.

It is not very easy to trace to its source the history of the invention to which the modern clock owes its parentage, as there are many vague allusions to horologes from a very early period; but whether these were some form of water-clock or wheel-and-weight clock is uncertain. But there seems little reason to doubt that Gerbert, a distinguished Benedictine monk (afterwards Pope Sylvester II.), made a clock for Magdeburg in 996, which had a weight for motive power; and that weight-clocks began to be used in the monasteries of Europe in the 11th century; though it is probable that these only struck a bell at certain intervals as a call to prayers, and had no dial to show the time. St Paul's Cathedral had a 'clock-keeper' in 1286, and presumably a clock; and Westminster possessed one about 1290, and Canterbury Cathedral about 1292. An entry in the patent rolls of the eleventh year of Edward II. (1318) proves that Exeter Cathedral had a clock in that year, and St Albans, Glastonbury, Padua, Strasburg, and many other places possessed them in the first half of the 14th century. The St Albans clock was a famous astronomical one made by Richard de Wallingford, who was son of a blacksmith of St Albans, and afterwards became abbot there (1326–34). The clock made for Glastonbury Abbey by Peter Lightfoot, a resident monk (about 1325), was removed in the reign of Henry VIII. to Wells Cathedral, and is now preserved in South Kensington Museum; as is also an old clock from Dover Castle, bearing the date 1348, and the initials R.L. in monogram. The original great clock at Strasburg Cathedral was made in the years 1352–70 (remodelled and reconstructed in 1571–74). A clock much superior to anything preceding it was that made by Henry de Vick (or Wick) for the tower of Charles V.'s palace at Paris in 1370–79. It was said to be on the bell of this clock that the signal was given for the massacre of St Bartholomew, 1572. By successive improvements clocks have gradually developed into the beautiful pieces of mechanism of the present day. Many curious and interesting specimens, such as that of Strasburg (q.v.) (1594), Lyons Cathedral (1598), St Dunstan's, London (1671; removed to a house in Regent's Park, 1831), and many others, have an historical interest. Many curiosities of mechanism are still constructed in the name of clocks, but generally eccentricity is their only feature. Those interested in the subject will find much information in Wood's *Curiosities of Clocks and Watches* (1866).

The date when portable clocks were first made cannot be determined. They are mentioned in the beginning of the 14th century. The motive power must have been a mainspring instead of a weight. The Society of Antiquaries of England possesses one with the inscription in Bohemian that it was made at Prague by Jacob Zech in 1525. It has a spring as motive power with fusee, and is one of the oldest portable clocks in a perfect state in England.

Illuminated clock dials, to shine at night, were introduced in the first quarter of the 19th century.

Clocks are of many and various kinds—striking and non-striking—turret-clocks big enough to carry hands 6 to 10 feet long and to ring a bell to be heard at 20 miles' distance, the good old-fashioned eight-day clock with its long case, the ornamental drawing-room spring clocks, Dutch clocks, American clocks, and an infinity of others. Technically, those which strike are called *clocks*, and those which do not strike, *timepieces*, irrespective of size. But, however much they may vary in size and appearance, they are all founded on the same principle, and it will answer our present purpose to illustrate that principle in its more ordinary form of the household clock.

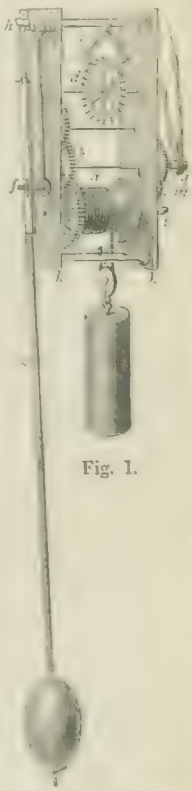


Fig. 1.

Fig. 1 represents a diagram of a non-striking timepiece. A weight, by turning a barrel, *a*, on which its cord is wound, sets in motion a train of wheels, *b*, *c*, terminating in the crown-wheel or escapement-wheel, *d*. These wheels are set between two plates which are fixed together by four pillars, one at each corner; the pillars are riveted into the back plate, *k*, and fastened with movable pins into the front plate, *k'*. The dial, removed in the fig., is also pinned on to the front plate by four short pillars or *feet*. The teeth in the pinions and wheels are so arranged in number that, while the crown-wheel revolves in 60 seconds, the centre wheel, *b*, takes an hour to do so. To regulate the speed at which the clock shall move, an arrangement called an escapement, *e* (to be afterwards more fully described), communicates by means of its *crutch* (at *f*) with the pendulum, *g*, which is suspended by a spring from the cock at *h*. The arbor of the barrel extends in a square form to the dial at *l*, where

it is wound up; a ratchet preventing its unwinding without turning the wheel with it. The hands have a separate train of wheels, called the dial or motion train, between the front plate and the dial. The arbor of the centre wheel, *b*, is produced to the dial, and on it is put the minute-wheel, revolving once an hour, with a long socket on which the minute-hand is fixed. Over this is placed a larger wheel, the hour-wheel, *l*, revolving in twelve hours, which is set in motion by the pinion of a duplicate minute-wheel, *m* (and also seen at *h*, fig. 6). The attachment of the minute-wheel to the centre-wheel arbor is, by means of a spring, enough to ensure the hands being carried round with the clock, but not enough to prevent the hands being turned, when necessary, by hand, without disturbing the interior works.

Striking-clocks have an additional train of wheels with separate weight (or spring) for the striking; it will be described further on.

Spring-clocks—i.e. clocks having a coiled spring as a motive power instead of a falling weight—have an arrangement of barrel and fusee chain similar to that of the watch, to be afterwards described. The spring is used when it is wished to save space, as the necessary fall of a weight requires a case deep enough to hold it, something about 4 feet for an eight-day clock. Their size also necessitates a short pendulum, which, of course, does not indicate seconds.

Previous to the invention of the pendulum, the regulating apparatus was generally as shown in fig. 2, which represents part of De Vick's clock already mentioned. The teeth of the escapement-wheel, I, acting on the two pallets, *h*, *i*, attached to the upright spindle or arbor, KM, to which is fixed the balance, LL, gave to the latter an alternate or vibrating motion, which was regulated by two small weights, *m*, *m*. The further these weights were moved from the centre, the more they retarded the movement; and, by means of numerous notches, their position could be shifted till the proper speed was secured.

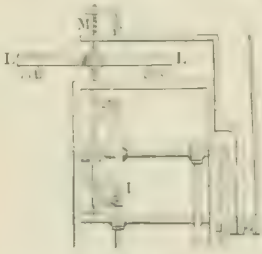


Fig. 2.

The great epoch in the history of horology was the introduction of the Pendulum (q.v.) as a regulating power. This has generally been attributed to Huygens, a Dutch philosopher, who was undoubtedly the first to bring it into practical use (1657). The fact of the actual invention, however, is obscure, and Sir E. Beckett says: 'The first pendulum clock was made for St Paul's church, in Covent Garden, by Harris, a London clock-maker, in 1621, though the credit of the invention was claimed also by Huygens himself, and by Galileo's son, and Avicenna, and the celebrated Dr Hooke.' In adapting the pendulum to the clocks previously existing Huygens had only to add a new wheel and pinion to the movement, to enable him to place the crown-wheel and spindle in a horizontal instead of a perpendicular position, so that the balance, instead of being horizontal as in De Vick's clock, should be perpendicular and extended downwards, forming a pendulum at one end.

The principle of construction adopted by Huygens, from the peculiar action of the levers and spindle, required a light pendulum and great arcs of oscillation; and it was consequently said that 'Huygens's clock governed the pendulum, whereas the pendulum ought to govern the clock.' About ten years afterwards the celebrated Dr Hooke invented an escapement which enabled a less maintaining power to impel a heavier pendulum. The pendulum, too, making smaller arcs of vibration, was less resisted by the air, and therefore performed its motion with greater regularity. This device is called the *anchor* escapement. It was brought by Hooke before the notice of the Royal Society in 1666; and was practically introduced into the art of clock-making by Clement, a London clock-maker, in 1680. It is the escapement still most usually employed in ordinary English clocks. Fig. 3 represents the more modern form of the anchor or recoil escapement: A, its axis; BC, the pallets; and D, the escapement-wheel revolving in the direction of the arrow. The connection between the pendulum and escapement may be seen in fig. 1. When the pendulum swings to the right AC rises, and a tooth escapes from C, while another falls on the outside of B, and, owing to the form of the pallet B, the train goes back during the remainder of the swing. The same thing occurs on the pendulum's return: the arm AB rises, a tooth escapes from B, and another falls on the inside of C and backs the wheelwork as before. As each of the thirty teeth of the wheel thus acts twice on the pallets, at B and again at C, it follows that a hand fixed on its arbor will move forward $\frac{1}{30}$th of a circle with each vibration of the pendulum and mark seconds on the dial. At each contact the onward pressure of the wheel gives an impulse to the pendulum, communicated through the crutch, sufficient to counteract the retarding effects of the resistance of the air and friction, which would otherwise bring it to a standstill. The length of a pendulum oscillating seconds is, for the latitude of London, about 39·14 inches.

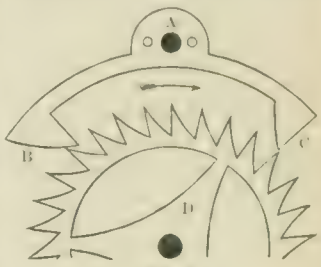


Fig. 3.

The defect of Hooke's escapement is the recoil, and various modifications have been devised to obviate this. The first and most successful was made by George Graham, an English watch-maker, in the beginning of the 18th century, and his improved form is called the *dead-beat* escapement (fig. 4). There the outer surface of B and inner surface of C are arcs of circles whose centre is A, and a little consideration will show that there can be no recoil. This escapement is adopted in time-keepers when great accuracy is required.

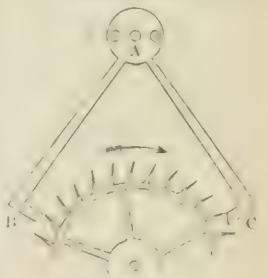


Fig. 4.

Many other escapements for clocks have been devised; but no one seems to have met with general favour except a certain form of *remontoire* or *gravity* escapement. The form of it shown in fig. 5 is called the *double three-legged escapement*, and was invented for the great clock at Westminster, in 1854, by E. B. Denison (afterwards Sir E. Beckett, Q.C.). In this clock the pendulum is 13 feet ½ inch long, to vibrate in two seconds, and its bob weighs 6 cwt. The escapement consists of two gravity impulse pallets, AB and AC,

moving on pivots at A. The escape-wheel consists of two three-legged wheels, *abc* and *def*, squared on one arbor a little distance apart, with three lifting pins (or three-leaved pinion) fixed between them. The three pins are shown by the three dots in the centre of the fig. The legs of the wheels are generally arranged alternately as in the fig. The pallets, with their arms *g* and *h*, lie between the wheels; at C is a block to lock the legs *abc*, and at B, on the other side, and of course acting in the reverse direction, is another to lock the legs *def*. The leg *a* is, in the fig., locked on the block at C. The pendulum, part of which is removed to show the escape-wheel, is supposed to be moving in the direction of the arrow, and has received impulse from the falling pallet AB at *l*; it is just beginning to touch the other pallet at *k*, which has been kept in position clear of the pendulum by one of the centre pins bearing on the arm *g*. The pendulum before turning again moves the pallet AC just enough to allow the leg *a* to escape from the locking-block at C; the wheel flies round, impelled by the clock-weight, till the leg *f* locks on the block at B; by the same movement the pin which is seen near the end of the arm *h* pushes the pallet AB away from the pendulum, which now gets impulse from the fall of the pallet AC. This goes on at each side alternately, the pallets being raised by the clock train, the pendulum only unlocking them. To make the motion go smoothly and prevent jar, a fly is attached to the arbor of the escape-wheel by a spring; it is seen in the figure. As the height to which the pallets are lifted is the same, however unequal the force communicated by the train may be, the arc of vibration of the pendulum remains constant, as the weight of the arm and the distance it falls are always the same.

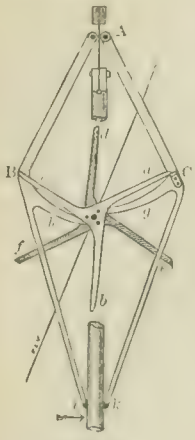


Fig. 5.

The gradual perfection of the clock required also improvements in the regulating power which finally resulted in the compensation pendulum (see PENDULUM).

The improvements in the escapement and the pendulum bring the mechanical perfection of the clock, as a time-keeping instrument, to the point which it has attained at the present day. But the art of horology would be incomplete unless there were some standard, independent of individual mechanical contrivances, by which the errors of each may be corrected. This standard is supplied by observatories, and the methods by which time is determined belong to the details of practical astronomy. There are in most parts of the United Kingdom now sufficient opportunities of setting clocks by a communication more or less direct with these establishments. When these are not to be had the sun-dial may still be used with advantage as a means of approximation to the correct time. The time which a clock ought to mark is *mean time*, the definition of which will be found in the articles DAY and TIME. The *mean time* at any place depends on the longitude. Supposing a clock to be set to Greenwich mean time, a clock keeping mean time of any place will be 4 minutes faster for every degree of longitude east of Greenwich, and 4 minutes slower for every degree west. Since the introduction of railways, clocks are usually set within Great Britain to Greenwich mean time. In the United States, where the extent of country makes it unadvisable to use the mean time of one meridian, four standard meridians were adopted in 1883—viz. 75°, 90°, 105°, 120° west of Greenwich. Clocks showing 'Eastern,' 'Central,' 'Mountain,' and 'Pacific' time are therefore respectively five, six, seven, or eight hours slower than Greenwich mean time.

For the more ready transmission of correct time to the public there is at Greenwich Observatory, as well as some others, a ball which is dropped by means of electricity precisely at one o'clock. Several attempts have been made to keep the public clocks of a town in perfect agreement with the mean-time clock in the observatory. One means of effecting this was by an electric connection and a modification of Bain's electric pendulum (1840), by Mr R. L. Jones of Chester (1857), on the suggestion of Mr Hartnup, the astronomer of the Liverpool Observatory. For a description, see ELECTRIC CLOCK. A clock in the castle of Edinburgh, by whose mechanism a gun is fired precisely at one o'clock every day, is controlled by the mean-time clock in the observatory on the Calton Hill.

It is not known when the alarum or when the striking-mechanism of the clock was first applied. The first striking-clock probably announced the hour by a single blow, as they still do in churches to avoid noise. During the 17th century there existed a great taste for striking-clocks, and hence a great variety of them. Several of Tompion's (died 1713) clocks not only struck the quarters on eight bells, but also the hour after each quarter.

The striking part of a clock (see fig. 6, which shows an English striking-clock by Ellicott, taken

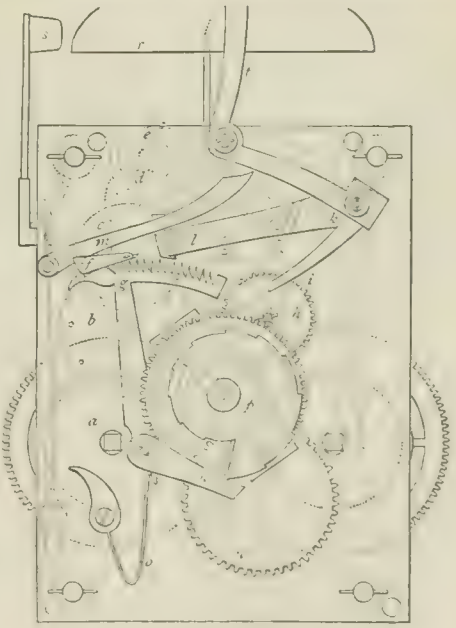


Fig. 6.

from the engraving in Moinet's work) is a peculiar and intricate piece of mechanism. The motive power is a weight used in a similar manner to that in the time-keeping train shown in fig. 1. In fig. 6, *a*, *b*, *c*, *d*, *e* are the striking-train; *e* is a fly which acts as a drag to prevent the striking being too rapid. The striking-train is kept in a normal condition of rest by the tumbler or gathering pallet

f, fixed to the prolonged arbor of the wheel *c*, being caught by the pin at the end of the rack *q*. A few minutes before the hour, a pin on the wheel, *k*, of the dial train, raises the arm, *e*, of the lifter *e*, *f*, *l*, which in turn lifts the lever *m*, which has by means of its hook been holding the rack, *q*, fixed. The tail end, *n*, of the rack is then forced by the spring *o* against the snail *p*. The snail is attached to the hour wheel of the dial train (see fig. 1), and consequently revolves in twelve hours, and has a step for every hour. The rack, in falling on it, is freed to the extent of a tooth (i.e. a tooth gets past the hook at *m*) for every step of the snail. As shown in the fig., one tooth would be freed, and the result would be that the clock would strike one; when the last step of the snail is reached, twelve would be struck. The result of this movement is that the striking-train moves a little till a pin on the wheel *d* catches on the end of the lifter *l*, which is turned down through a hole in the plate for the purpose. The resulting sound is called 'warning.' Precisely at the hour the pin on the wheel *h* slips past the end, *i*, of the lifter, which falls, relieving the striking-train; the hours are struck on the bell *r*, by the hammer *s*, acted on by the pins on the wheel *b*. As the tumbler attached to the wheel *c* revolves once for every stroke of the bell, it *gathers* up a notch of the rack at each revolution, until it is stopped by a return to its original position of rest at the pin on the rack *q*. The rack, lever, and lifting-piece are *above* the front plate, and are pivoted on studs fixed into it. A lever, *t*, moved by a pointer on the dial, throws the striking work out of gear when the clock is required to be silent. In the fig. *u* is an extra wheel for driving a hand to show the days of the month.

Clocks which chime the quarters and half-hours have generally a third train of wheels for the chiming.

In England clocks are principally made in London and Handsworth near Birmingham, though there are many small local makers. Many of the ornamental clocks and timepieces are manufactured in France.

Dutch or *wooden clocks* were first introduced about the middle of the 17th century. Though made on the same principle as ordinary clocks, their arrangements are much simplified, and their principal parts made of wood and wire, only the actual wheels being brass. They are very cheap, and consequently became very common in lower-class households and kitchens. They are made in the Black Forest in Germany, and, considering their mode of manufacture, are wonderfully accurate as timekeepers when properly taken care of.

They are now rapidly being superseded by *American clocks*, which, on account of their cheapness, neatness, and portability, have become very popular. Their manufacture is a great industry in the United States, at Waterbury in Connecticut, Brooklyn, New York, and many other places. The wheels and plates are stamped, and very little manual labour is spent on them, every part being interchangeable in similar-sized clocks. Their appearance is too familiar to require a detailed description. To many of these cheap clocks alarums are fitted, which can be set to sound at any hour. See ALARM.

Watches.—The modern perfect watch and chronometer may be said to be the result of a gradual development from the early clock rather than that of any particular invention. The first step was obviously to find some other form of power than the weight; and this was made in the end of the 15th century by the invention of the coiled spring as a motive power, but where, or by whom, is uncertain.

It seems to be taken for granted that Peter Hele, a mechanician of Nuremberg, as early as 1490 made small pocket clocks of steel which showed and struck the hours, and were driven by a coiled spring. These from their oval shape were called Nuremberg eggs. The next step was the invention of the fusee, an arrangement to overcome the weakening of the spring as it became uncoiled. This also is involved in obscurity, though it must have occurred early in the 16th century, as the clock mentioned as made by Jacob Zech in 1525 has that modification. At first a gut cord was used, the chain being a modern invention. The balance used was exactly like that of De Vick's clock (fig. 2), except that the weights on the arms of it were fixed instead of hanging. The next step of any consequence was the invention of the balance-spring by Dr Hooke in 1658–60, which was the foundation of all the varied improvements resulting in the almost perfect chronometer compensation-balance of the present day.

Although watches were introduced into England in Henry VIII.'s time, they did not come into general use till the reign of Elizabeth, and then their cost confined them to the wealthy. At first they were very large, on account of their striking part; and their cases, without glass, were pierced with elaborate open work to let out the sound of the bell. When the striking work was dispensed with, they of course became much smaller, and gradually drifted into being ornamental rather than useful. They were richly ornamented with pictures in enamel, set in the heads of walking-sticks, in bracelets, in finger-rings, and enriched with the most costly jewels. They were encased in crystal and in imitation skulls, and in fact became subject to all the vicissitudes of fashion, through which it would be needless for us to follow them. The curious will find much entertaining matter in Wood's work already referred to. Previous to the invention of the balance-spring, watches (as also clocks) had only one hand, which showed the hours; but after that event the greater power of regulating the motion led to the introduction of extra wheels to carry minute, and finally seconds, hands.

The watch is essentially a miniature edition of the ordinary spring-clock, except in two points—viz. that it has a balance-spring instead of a short pendulum, and that, as the escapement-wheel revolves in about six seconds, an extra wheel revolving in a minute is introduced to carry the seconds hand.

The train of an ordinary verge watch is shown in fig. 7: *a* is the barrel enclosing the mainspring and turning, by means of the fusee chain *b*, the fusee and great wheel *c*, and, through the pinions and wheels *d*, *e*, *f*, the escape wheel *g*. The hands

Fig. 7.

or motion train are exactly as described for clocks, and are similarly carried by the elongated arbor of the centre-wheel *d*. As will be seen in the fig., the fusee is of a peculiar shape. The reason is as follows: When the chain, which is fixed at the broadest part of the fusee, is fully wound up, it goes from the narrow part to the barrel where the other

end is fixed, and of course the spring is also fully wound. At this point the spring is strongest: and, pulling upon the narrow end of the fusee, has the least leverage. As it gradually unwinds, and at the same time becomes weaker, the leverage, owing to the shape of the fusee, becomes in exactly the same ratio greater, and thus the power on the machinery is equalised till the whole chain is unwound. The spring is wound up by the squared arbor, *m*, of the fusee through an opening in the inside case; the arbor of the spring-barrel being of course fixed. An ingenious stop arrangement prevents the possibility of damage by over-winding. The mainspring is a thin ribbon of finely tempered steel (fig. 8). The inner end is hooked on to a catch on the arbor of the barrel round which it is coiled, and the outer end to a catch on the inside of the rim of the barrel. In the American watches, now so common, the fusee is dispensed with, and the great wheel is on the barrel and directly gives the motion. In recent years this form is also used in almost all keyless watches. The verge escapement shown in fig. 7 is exactly the same as that shown in De Vick's clock (fig. 2). Two pallets, *h*, *i*, moved alternately in opposite directions by the teeth of the escapement-wheel, cause a vibrating motion in the balance *k*, which is steadied and regulated by the balance-spring *l*. The balance and spring are shown in plan in fig. 9: *a* is the balance and *b* the spring, which is arranged spirally. The inner end is fixed to the staff of the balance, the outer to a stud *c*, fixed to the watch-plate. Its beautifully delicate motion may be observed in any watch, as all watches have the spiral spring except chronometers, which have a cylindrically coiled spring instead. The length of the balance-spring in proportion to the weight of the balance is an important factor in regularity of motion, and for minute adjustment an instrument, *d*, *e*, called a *regulator* is attached to it. Two curb-pins at *d* enclose the outer coil of the spring, and, in the case of the watch going fast, a movement to the left lengthens the spring and retards the speed in proportion. For too slow a motion a movement to the right will shorten the spring and quicken it.

Fig. 8.

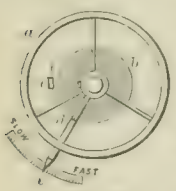


Fig. 9.

The principle involved in the clock-pendulum and watch-balance alike is that by their regularity of movement they shall keep the mechanism from going either too fast or too slow, and that in return the mechanism shall give repeated impulses sufficient to keep them perpetually in motion.

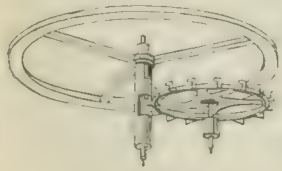


Fig. 10.

As the vertical or verge escapement, owing to the recoil of the escape-wheel and other causes, is not to be depended on for very great accuracy, attempts were immediately made after the invention of the balance-spring to devise some form of escapement which would give better results. Hooke, Huygens, Hautefeuille, and Tompion introduced improvements, but the first to succeed was made by George Graham, the inventor of the dead-beat escapement in clocks. This is called the *horizontal* or *cylinder* escapement (fig. 10). It was introduced in the beginning of the 18th century, and it is still the escapement used in many foreign watches. The impulse is given to a hollow cut in the cylindrical axis of the balance by teeth of a peculiar form projecting from a horizontal crown-wheel.

Other forms of escapement in high estimation are the *lever*, the *duplex*, and the *chronometer* '*spring-detent*' escapement. The lever escapement (invented about 1770 by Thomas Mudge) is the dead-beat escapement (see fig. 4) adapted to the altered conditions of a watch. Fig. 11 shows the form used in most modern English watches. The pallets, P, P, are fixed to a lever, A (pivoted at F), and there is an impulse pin, B (usually a piece of ruby), set in a small disc, C (called the roller), on the axis of the balance.

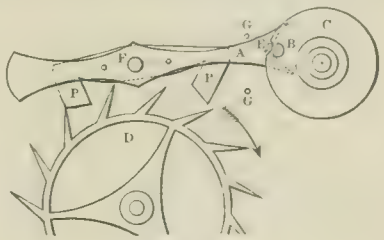


Fig. 11.

The ruby pin works into a notch at the end of the lever, and the pin and notch are so adjusted that when a tooth of the escape-wheel D leaves the pallet the pin slips out of the notch, and the balance is detached from the lever during the remainder of its swing; whence the name *detached* lever escapement, originally applied to this arrangement. On the balance returning, the pin again enters the notch, moving the lever just enough to allow the tooth next in order to escape from the dead face of the pallet on to the impulse face; then the escape-wheel acts upon the lever and balance; the tooth escapes, and another drops upon the dead face of the pallet, the pin at the same time passing out of the notch in the other direction, leaving the balance again free. This arrangement is found to give great accuracy and steadiness of performance. A safety pin, E, on the lever, prevents the wheel being unlocked, except when the impulse-pin is in the notch of the lever. Two *banking-pins*, GG, keep the motion of the lever within the desired limits.

In the duplex escapement (invented about 1780) the escape-wheel has two sets of teeth, hence the name. One set, something like the lever-wheel (fig. 11), lock the wheel by pressing on the balance staff, and the other, standing up from the side of the rim of the wheel, give impulse to the balance. It is rarely used now.

The chronometer spring-detent escapement was invented in principle by Le Roy about 1765, and perfected by Earnshaw (who also invented the cylindrical balance-spring) and Arnold about 1780. It is shown in fig. 12; *a* is the escape-wheel, which has fifteen teeth; *b*, the impulse-roller, fixed on the same staff as the balance; *c*, the impulse-pallet; *d*, discharge-pallet; *e*, locking-pallet—all the pallets are of ruby or sapphire; *f*, the blade of the detent fixed at *k* by its spring *g*; and *h*, the gold-spring. In the fig. a tooth of the escape-wheel is caught on the locking-pallet; the discharge-pallet (carried round by the roller in the direction of the arrow), by pressing on the end of the gold-spring, which in turn presses on the horn of the detent *i*, bends the detent enough to allow the tooth to escape from the pallet. The

escape wheel, being released, overtakes the impulse-pallet and drives it on till their paths diverge and they separate. The wheel is again brought to a

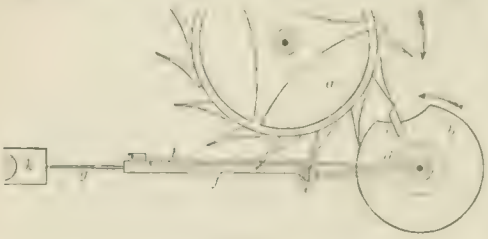


Fig. 12.

stand by the locking pallet of the detent, which, on being released by the discharge pallet, has sprung back to its original position. The roller, having made its vibration, is brought back by the spring. In the return the discharge-pallet forces itself past the end of the gold-spring, the impulse-pallet clears the teeth of the escape wheel, and the balance goes on till the momentum is exhausted, when the spring induces another vibration, the wheel is again unlocked, and the impulse-pallet gets another blow. By receiving impulse in one direction and unlocking at every alternate vibration only, the chronometer-balance is more thoroughly detached than any other. It is very delicate, however, and, though the most perfect known, it cannot stand rough usage, and is not so suitable for ordinary pocket-watches as a good lever. At sea the chronometer is hung in Gimbals (q.v.), so as to be always horizontal whatever the motion of the vessel.

In watches, even more than in clocks, variations of temperature, unless provided for, produce variations in the rate of going. A rise in the temperature makes the balance expand, and therefore augments its moment of inertia. It diminishes the elasticity of the spring; and the time of vibration of the balance, which depends upon the moment of inertia directly, and upon the elastic force of the spring inversely, is increased—the watch, that is, goes more slowly. A fall in the temperature is attended by opposite results, the watch going more rapidly than before. Compensation can obviously be made in either of two ways by an expedient for shortening the effective length of the balance-spring as the temperature rises, so as to increase the elastic force of the spring; or by an expedient for diminishing the moment of inertia of the balance as the temperature rises, so as to correspond to the diminution of the force of the spring. The first method was that made use of by John Harrison (q.v.) in his chronometer, and

Fig. 13.

it depended on a laminated bar of brass and steel fixed at one end, called a *compensation curb;* the free end carries two curb pins, which embrace the balance-spring, and, as the bar shrinks and expands, regulate the length of the spring. It is never used now. An adaptation of the other method, invented in 1782 by John Arnold, and improved by Thomas Earnshaw, is that which is always employed now. Fig. 13 shows the form employed for marine chronometers, and fig. 14 that for pocket chronometers and watches: t, a, t' (fig. 13) is the main bar of the balance, and t, b, t', b' are two compound bars, of which the outer part is of brass and the inner part of steel, carrying weights, c, c', whose position may be shifted to or from the fixed end, according as the compensation is found on trial to be less or more than is desired. Brass expands more with heat and contracts more with cold than steel; consequently, as the temperature rises the bars with their weights, being fixed at one end to the main bar, bend inwards at the free end, and so the moment of inertia of the balance is diminished; as it falls they bend outwards, and the moment of inertia is increased; and of course the diminution or the increase must be made exactly to correspond to the diminution or increase in the force of the spring. The screws, d, d, fitted to the fixed end of each of the compound bars are used for bringing the chronometer to time; sometimes the smaller ones are dispensed with. In fig. 14 the principle is the same: a, a, a, a are the time screws (equally distributed in the watch-balance); the others are for compensation, and their positions may be shifted or larger ones substituted if necessary.

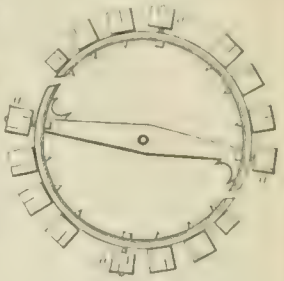


Fig. 14.

The modern marine chronometer is just a large watch fitted with all the contrivances which experience has shown to be conducive to accurate time-keeping—e.g. the cylindrical balance-spring, the detached spring-detent escapement, and the compensation-balance. Harrison's chronometer, mentioned above, was the first, and was completed after many years of study in 1736. For a description, see *British Horological Journal*, vol. xx. page 120. After many trials and improvements, and two test voyages to America, undertaken for the satisfaction of the commissioners, the last of which was completed on the 18th September 1764, the reward of £20,000, which had been offered by government for the best time-keeper for ascertaining the longitude at sea, was finally awarded to him. Harrison made many other inventions and improvements in clocks and watches, including his maintaining spring to the fusee, to keep the works going while being wound; a form of remontoire escapement, &c.

Somewhat later than this several excellent chronometers were produced in France by Berthoud and Le Roy, to the latter of whom was awarded the prize by the Académie Royale des Sciences. Progress was still made in England by Mudge, Arnold, and Earnshaw, to whom prizes were awarded by the Board of Longitude. The subsequent progress of watch-making has been chiefly directed to the construction of pocket-watches on the principle of marine chronometers, and such accuracy has been obtained that the average error is reduced to one second a day.

The compensation of an ordinary balance chronometer cannot be made perfectly accurate for all degrees of temperature, but only for two points. The explanation of this lies in the fact that, while the variations of elastic force in the spring go on uniformly in proportion to the rise or fall of the temperature, the inertia of the balance varies, not

inversely as the distance of its weights from the centre, but inversely as the *square* of the distance of the centre of gyration from the centre of motion.

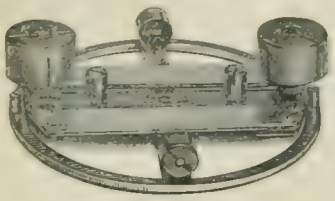


Fig. 15.

The particular points in the case of any chronometer are matter of adjustment. For instance, one chronometer may be made to go accurately in a temperature of 40°, and also in a temperature of 80°, at other temperatures being not so accurate; another chronometer to go accurately at a temperature of 20° and 60°. It is manifest that the former would be adapted to voyages in a warmer, the latter to voyages in a colder climate. To more fully adjust the compensation certain pieces are fixed to the balance to act in heat or in cold, and this is called auxiliary compensation, and there are at least two or three balances invented of recent years, one of which is shown in fig. 15, which are practically self-adjusting for the ordinary range of temperatures to which marine chronometers are subjected. The solution of the problem seems to be in setting the laminæ flat instead of vertical, and making the bar also bimetallic.

Apparatus for testing chronometers have been long in use in the observatories at Greenwich and Liverpool. In the latter there is now an extensive apparatus for this purpose, devised by the ingenious astronomer, Mr Hartnup. In a room which is isolated from noise and changes of temperature the chronometers are arranged on a frame under a glass case, so contrived that they may be subjected in turn to any given degree of temperature. The rate of each under the different temperatures is observed and noted, and the chronometers registered accordingly.

A large proportion of modern watches are made to wind and to set the hands from the pendant. Fig. 16 shows the form of keyless work chiefly employed in English non-fusee watches. The chief part is the three wheels working in the rocking-bar *ab*, one of which gears with the winding-wheel, *d*, of the barrel when the rocking-bar, which is capable of a little motion, is in its normal place, as in the fig. A contrate wheel is fixed on the end of the winding-button *c*, and by its means, when the button is turned, the train is set in motion and the barrel wound. When the hands are required to be set, a push-piece in the case bearing on the end, *b*, of the rocking-bar is pressed by the finger, taking the rocking-bar wheels out of gear with the winding, and putting them in gear with the hand-wheels at *c*. The hands may then be turned by the winding button, and, the push-piece being let go, the train returns to its normal position. The use of the fusee being attended with some amount of complication in the keyless mechanism, it is usually dispensed with on this account, and one of the most modern arrangements in an English keyless watch is shown in fig. 17. The barrel, *a*, is here made to occupy all the height between the pillar (or lower) plate and the top limit of the movement, and all the space between the centre pinion and the balance cock, in order to get a long, thin mainspring; the advantage of which is that there is an abundance of power (much more than is required for a day's going), and only a portion of the spring is used for the ordinary winding for twenty-four hours. This practically insures an adjustment of the motive power as nearly equal to that obtained by the use of the fusee as it is possible to arrive at.

Fig. 17.

Fig. 16.

Repeating watches were first made about 1676, the invention being claimed by Daniel Quare, Edward Barlow, and Tompion. They have a striking arrangement very much on the principle of the striking-clock, and on compressing a spring they at any time strike the hours and quarters, and in some cases the minutes. They are very expensive and liable to go out of repair, and repairs are costly. They have nearly gone out of use. For stop-second arrangements to record swift passing events, see CHRONOGRAPH.

In England watches are mostly made at Preston, Liverpool, Coventry, and at Clerkenwell, London, where the division of labour principle is carried out in an extreme degree—many small factories making, for instance, only balances, others springs, others cases, others hands, &c., only that small number who put the works together seeing the complete watch. At Kew Observatory there are arrangements for testing watches, and granting certificates if satisfactory, on payment of a fee. In the United States the manufacture of watches, like that of clocks, is carried on in a much more wholesale manner; the wheels and plates being stamped by machinery, every similar part being exactly alike and interchangeable; and on account of the economy of manual labour, they can be turned out marvellously cheap. Generally the large clock-factories also manufacture watches.

See Thiout l'aîné, *Traité d'Horlogerie* (1741); Lepaute, *Traité d'Horlogerie* (1755); F. Berthoud, *Traité des Horloges Marines* (1773), *Histoire de la Mesure du Temps par les Horloges* (1802); Thos. Reid, *Treatise on Clock and Watch Making* (1819); Jurgensen, *Principes de la Mesure du Temps* (1838); Monnet, *Nouveau Traité général d'Horlogerie* (1848); Wood, *Curiosities of Clocks and Watches* (1866); Denison (afterwards known as Sir E. Beckett and then as Lord Grimthorpe), *Treatise on Clocks and Watches and Bells* (1874; 7th ed. 1886); books by J. F. Kendal (1892) and F. J. Britten (1894); Saunier, *Modern Horology* (Eng. trans. by Tripplin & Rigg, 1885); Rombol, *Les nouvelles Découvertes de l'Horlogerie* (Geneva, 1889); Britten, *Watch and Clock Makers' Handbook* (1889); *The Practical Horological Journal* (monthly from 1859); *La Revue Chronométrique* (monthly from 1857).

Horoscope. See ASTROLOGY.

Horrocks, JEREMIAH, an astronomer of remarkable genius generally known as the first observer of the transit of Venus, an account of which phenomenon he has given in a Latin treatise entitled *Venus in Sole visa*. He was born at Toxteth, near Liverpool, apparently in 1619; he entered Emmanuel College, Cambridge, May 18, 1632; was appointed in 1639 to the curacy of Hoole, Lancashire, in which village he made his famous observation (November 24, 1639, O.S.), while a mere youth. He died suddenly on January 3, 1641, the day before an intended journey, having promised to visit his chief friend, William Crabtree. Dr Wallis, his contemporary, informs us that Horrocks at the time of his death 'had not completed his twenty third year.' Newton, in the *Principia*, bears honourable testimony to the value of Horrocks's astronomical work, especially commending his lunar theory as the most ingenious yet brought forward, adding, 'and, if I mistake not, the most accurate of all.' Horrocks is frequently mentioned by the scientific men of the 17th century; the observation of the transit being by no means regarded as his sole astronomical achievement, as he added to our knowledge of the physical cause of celestial motions, deduced the solar parallax, corrected the solar diameter, and made tidal observations. Hevelius printed the *Venus in Sole visa*, which first appeared in Germany (1662); a translation of this work, with memoir by Whatton, appeared at London in 1859. In 1678 Horrocks's fragmentary works were published under the auspices of the Royal Society, being edited by Dr Wallis, with the title *Jeremiæ Horrocci Opera Posthuma*, &c. The name of Jeremiah Horrocks, long forgotten except by astronomers, is now, 'after the lapse of more than two centuries,' engraven on marble in Westminster Abbey.

Horse (*Equus*), an ungulate or hoofed mammal of the order Perissodactyla, characterised by having an odd number of toes; the family Equidæ formed the group Solidungula of old writers, owing to the presence of only a single hoof, which marks them off quite sharply from all allied animals. The English name is found in Anglo Saxon as *hors*, and is cognate with the Icelandic *hross*, German *ross*; it is sometimes referred to Sanskrit root *hresh*, 'to neigh,' but, according to some, with more probability, to a Teutonic root *har*, 'to run,' cognate with Latin *currere*. The Latin name is no doubt from the root *ak*, conveying the idea of swiftness; Sanskrit *açva*; Gr. *hippos* or *hikkos*; Lat. *equus*.

The existing species of the genus Equus are about half a dozen in number: (1) The Horse (*E. caballus*) is characterised by the tail being furnished with long hairs quite from its base; by the long and flowing mane; by the possession of a bare callosity on the inner surface of the hind as well as of the fore legs; and by the head and ears being smaller and the limbs longer than in the other species. (2) The Ass (*E. asinus*) is almost as widely distributed as the horse; it is probably of African origin, being almost certainly conspecific with the Abyssinian form, *E. tæniopus*. (3) The Asiatic Ass (*E. hemionus*) differs from the common ass in being of a more reddish colour, in the absence of the shoulder stripe, and in having smaller ears. By some zoologists it is split up into three species—the Syrian Wild Ass (*E. hemippus*), the Onager (*E. onager*), and the Kiang or Dziggetai, to which the term *E. hemionus* then becomes restricted. (4) The Quagga (*E. quagga*) has dark stripes upon the head and shoulders on a brown ground; it is said to be now extinct. (5) Burchell's Zebra (*E. Burchelli*) is white, with stripes on the body and the upper parts of the limbs; it extends from the Orange River to Abyssinia. (6) The Mountain Zebra (*E. zebra*) is white, with long black stripes reaching down to the feet. It is limited to the Cape Colony, and is rapidly disappearing. These last three are sometimes united into a special genus, Hippotigris. (7) The explorations of the Russian traveller Pzhevalski (Prejevalsky) in 1881 added another species to the list of Asiatic forms, which has been called after him. The long hairs of the tail begin only half-way down it; the mane is short and erect, and there is no forelock; the head is large and heavy; the ears smaller than those of the ass. It inhabits the dry sultry regions of the Dzungarian Desert, living in companies of fifteen to twenty, each led by a stallion. Only two herds were observed, and only one specimen was secured. The resemblance which this species presents to the horse of early sculptures has been pointed out by several observers.

Horse, with names of parts:
1, crest; 2, withers; 3, croup; 4, haunch; 5, hock; 6, cannon; 7, fetlock; 8, pastern; 9 head; 10, coronet; 11, arm; 12, gullet; 13, muzzle.

The anatomical structure of the horse has been the subject of many elaborate treatises, and only a very brief outline of its more salient features can be offered here. The skull is remarkable for its great length, especially as regards the bones of the face, which occupy an extent twice as great as those of the cranium. The orbit is approximately circular and complete behind, a fact which distinguishes the horse from the tapir and rhinoceros, as well as from its fossil allies. The co-operation of the zygomatic process in the formation of the lower part of the orbit is an unusual if not a unique feature. The great cheeks are formed mainly of the maxillary bones, though the lachrymal and malar bones occupy a considerable area in the upper portion. The nostrils are roomy, provided with extensive turbinal bones, and roofed in by the nasal bones, which are broad behind, pointed in front. In the naked skull the anterior openings of the nostrils extend far back at either side between the nasal and premaxillary bones. The palate, like the floor of the cranium, is long and narrow, forming a kind of valley between the two rows of elevated molar teeth. Below the brain-case there is a distinct canal through the alisphenoid bone for the internal maxillary artery. In the region of the ear the tympanic and periotic bones are fused together, but are loose from the skull, being held in position only by the descending process of the squamosal bone. The hyoid bone is well developed, especially as regards its anterior arch, and the basal segment sends a process forward into the tongue. The rhinoceros and tapir have a similar, but smaller, process. The mandible is very large, and the lower and hinder part is expanded into a broad flat plate for the attachment of the masseter muscle. The vertebral column is made up of seven cervical, eighteen

dorsal, six lumbar, five sacral, and fifteen or more caudal vertebræ. Most of the vertebræ are more or less hollowed behind, this character being more marked in the fore than in the hinder part of the spine. The dorsal processes of the vertebræ in the forepart of the chest are very high, and to them is attached the great elastic ligament (*ligamentum nuchæ*) which relieves the muscles of the heavy weight of the head and neck. The sternum consists of six segments, the anterior one being shaped something like the prow of a boat. There are no collar-bones, these being in fact absent from all hoofed mammals (Ungulata). The shoulder-blade is long and narrow, and bears a prominent rounded tubercle, representing the coracoid bone. The humerus is short and stout: of the two bones of the forearm the ulna is well developed behind, where it forms the great process (olecranon), projecting backwards from the elbow-joint, but it tapers gradually away below, and is firmly fused with the radius. The wrist ('knee' of common speech) consists of six bones, disposed in two rows of three each; in the second row the middle bone (*os magnum*) is very large, and supports the cannon-bone, whilst the two laterals are small, and each supports a splint-bone. The fore-foot of the horse consists of only one fully-developed digit, corresponding to the middle finger of the human hand. The metacarpal bone of this finger is known as the 'cannon-bone,' and approximated to its upper end are the thin tapering rudiments of the second and fourth metacarpals, commonly known as 'splint-bones;' the cannon-bone is succeeded by three phalanges, known respectively as the 'large pastern,' 'small pastern,' and 'coffin-bone.' Behind the foot are three small bones (sesamoids), two behind the joint between the cannon-bone and large pastern (commonly called the 'fetlock'), and a single one placed transversely behind the joint between the small pastern and the coffin-bone, commonly called the 'navicular.' In the hinder limb the thigh-bone has a prominent flattened process on its outer side, about one-third down; this is known as the 'third trochanter,' and is characteristic of all odd-toed ungulates. What is really the knee is known as the 'stifle joint.' The fibula is rudimentary. The tarsus consists of seven bones. The os calcis has a well-marked flattened heel-process, commonly known as the 'hock.' The bones of the hind-foot resemble very closely those of the fore-foot, and have the same names. A very strong ligament passes down the hinder surface of the foot, and the two smaller sesamoid bones above mentioned are imbedded in it. It is commonly known as the 'suspensory ligament of the fetlock;' occasionally muscular fibres are found in its substance, and this fact, taken in conjunction with its position and attachments, shows that it is the representative of the interosseous muscles of the human hand. The navicular bone lies in the tendon of the deep flexor muscle of the foot.

The hoof is the representative of the claws or nails of other animals. The last segment of the toe is widened out to form a foundation for it, and this is increased by cartilaginous side-pieces and a fibrous and fatty sole-piece. The integument is, of course, continuous with the skin of the limb, but it is extremely vascular, and its surface is developed into papillæ or laminæ, which secrete the horny matter of the hoof. The chief share in this process is taken by the 'coronary cushion,' or thickened ring round the upper part of the foot, and by the cushion in the sole. The result of this is that the hard external tissue of the hoof is renewed from within as fast as it wears away on the outside. The lower surface which comes into contact with the ground is hollow, and its centre is occupied by the 'frog,' a triangular eminence with its apex directed forwards, and consisting of pavement epithelial cells arranged concentrically. Other horny structures are the so-called 'chestnuts,' hard oval warts situated on the inner surface of all four legs in the horse (*E. caballus*), and of both fore-legs in the other members of the genus.

The teeth of the horse when the series is complete are forty-four in number: three incisors, one canine, four premolars, and three molars on either side of each jaw. The incisors form a semicircle: they have a pit in the apex partially filled up with bony matter, and this it is which produces the well-known appearance of concentric rings as the tooth wears away, and their disappearance when the wearing has carried the surface of the tooth beyond the bottom of the pit. The canines are either rudimentary or absent in the females. Between them and the grinding-teeth is a wide gap (diastema) in which the bit is placed. The first premolars are either quite rudimentary or absent; when present they are usually lost before maturity, so that the grinding-teeth in actual use only amount to six in number. They have very long crowns, which are gradually pushed up as the surface wears away; this peculiarity in structure is only seen in the teeth of the more recent horses, and is probably to be associated with the removal of the animal from swamps to drier plains, and hence from soft moist vegetation to food more difficult of mastication. The enamel of the teeth forms a curved folded plate, the pattern being derivable from that seen in other Perissodactyles; and it is this which produces the characteristic pattern seen in the surface of the horse's molars. The temporary or milk teeth are twenty-four in number—three incisors and three milk-molars on either side of each jaw. At birth the first and second molars are present; at one week old the central incisors appear; at six weeks the two next incisors; at three months these incisors are level, and a third molar has come into view; at six months obliteration is apparent in the central incisors; at eight months the lateral incisors have erupted, making the full number of six in each jaw; at one year the fourth molar is visible; at eighteen months the mark is very faint in the central incisors; at two years old there are five molars; at three years the permanent central incisors replace the temporary ones; at three and a half and four and a half years respectively, the same happens with the second and the lateral incisors, and at the latter date the canines appear in the male; at five years the mark is nearly, and at six years quite effaced in the central incisors; at seven years the like has happened to the next incisors; and at eight years the mark has disappeared from all the teeth, and the canines have become blunted. Hence by the presence of the different teeth and their condition as regards wear, it is possible to tell the age of a horse with considerable accuracy up to six or eight years of age, but after that no reliable conclusions can be drawn from these organs.

The lips are flexible; the palate long and narrow, and transversely ridged; the soft palate has no uvula, and, except during the actual process of swallowing, embraces the epiglottis, so that respiration is carried on entirely through the nostrils. Three pairs of salivary glands are present, the parotid being by far the largest. The stomach is simple and a good deal curved upon itself: at the œsophageal opening is a kind of muscular valve to which is commonly attributed the difficulty which a horse experiences in vomiting. The small intestine is eighty or more feet in length, and terminates in a large cæcum with sacculated walls. The liver is

almost symmetrical, and there is no gall-bladder. The heart is rather longer; the aorta gives off almost immediately a large trunk—the so-called 'anterior aorta'—which subsequently divides into the two axillary and two carotid arteries. The anterior apertures of the nostrils are large, and can be dilated by special muscles; immediately within the opening on the upper and outer side is a blind pouch ('false nostril') 2 or 3 inches in depth and of unknown function; in the ass it is even larger. There are also air-sacs in the hinder and upper part of the pharynx which spring from the Eustachian tubes. The time of pairing falls between the end of March and beginning of June. The period of gestation is eleven months, and only one foal is born at once. The mare is capable of breeding at three years old, but the stallion is not usually allowed to pair until four years of age. The average age of a horse may be put down at twenty years; the greatest age on record is believed to be sixty-two.

The senses of the horse are acute, though many animals excel it in this respect; but its faculties of observation and memory are both very highly developed. A place once visited or a road once traversed seems never to be forgotten, and many are the cases in which men have owed life and safety to these faculties in their beasts of burden. Even when untrained it is very intelligent: horses left out in winter will scrape away the snow to get at the vegetation beneath it, which cattle are never observed to do. Perhaps this may be inherited from their ancestors in the Siberian plains; but curiously enough the very same habit is observed in the horses of the Falkland Islands, whose ancestors in La Plata could have had no occasion to show the same instinct for many generations back.

With patience and kind treatment the horse can be trained to go through quite complicated feats of memory and perception. That it possesses also an accurate sense of time is clear from the facility with which it can be taught to walk, trot, and dance to music, or take part in concerted evolutions. Its knowledge of tunes is evinced by its comprehension of military signals. It is very timid and cautious and suspicious of every new sight or sound; while in respect of moral qualities it is scarcely too much to say that horses are as diverse as men.

The history of the horse can be traced back, though with extensive gaps, to the beginning of the Tertiary geological period, where we find the remains of a small ungulate no larger than a fox, to which the appropriate name *Eohippus* has been given. It was of very generalised structure, having for example four complete toes and a rudimentary fifth on the fore-feet. In Miocene times it was succeeded by *Miohippus* and *Anchitherium*, which in their turn gave place to the Pliocene *Hipparion* and *Pliohippus*, each of these showing an increase in size and a closer approach in structure to the modern horses. The history of the feet in particular furnishes one of the best examples of the gradual evolution of a specialised from a more generalised organ (see FOOT). The skull and neck became coincidently more elongated, and the teeth underwent changes which have been already alluded to.

The etymological synopsis above given shows that the horse was known to the Aryan people before their dispersal. Incised figures of the horse upon bones have been found in cave-deposits referred to the Palæolithic age, and there is evidence to show that at this period the animal was an object of the chase and a source of food. It was probably small and heavy, with a large head and an upright or hog-mane; and attention has been already called to the resemblance which some of the sculptured figures of antiquity bear to the *Equus przewalskii* above described.

The horse reappears in Neolithic remains in the Swiss lake-dwellings and elsewhere, but here apparently still as an object of the chase. The precise date of its domestication is uncertain. On Egyptian monuments no trace of it appears before the expulsion of the Hyksos or shepherd kings; and it is generally stated that the animal was previously unknown to the Egyptians, though it can hardly be considered as proved that it was introduced by the Hyksos.

In Scripture the horse is only referred to in connection with warfare; witness the poetic description of the war-horse in the Book of Job. The earliest mention of the animal in Holy Writ occurs in connection with the famine in Egypt, when Joseph gave the people corn in exchange for their horses; and its use for riding is alluded to in 2 Kings, xviii. 23.

In Homeric times the horse was not used for riding; indeed, at the battle of Marathon (490 B.C.) the Persians, but not the Greeks, used cavalry. After 450 B.C., however, the art was practised in Greece, and a treatise upon it, of somewhat later date, from the pen of Xenophon, still exists. The war-horses of the Britons and the chariots, their wheels armed with scythes, are described by Cæsar. Athelstan paid special attention to the breed of English horses, and even imported animals from Spain for its improvement. In this he was followed by other monarchs, as John and Edward III. In the reign of this latter king a law was passed forbidding the exportation of horses, and a number of Spanish jennets were introduced. Henry VIII. made various enactments for improving the condition of the English horse, particularly relating to the pasturing of entire horses upon commons and open lands, where a good deal of promiscuous and detrimental breeding had taken place. In the reign of Elizabeth it was penal to make over a horse 'to the use of any Scottishman,' a prohibition naturally repealed by her successor, who further signalised himself by bringing over to England the 'Markham Arabian,' believed to have been the first of that breed introduced. He did not prove a success; but still the experiment was repeated from time to time, and in William III.'s reign the 'Byerly Turk,' the first of a celebrated trio, was brought over to England. At the very beginning of the 18th century came the 'Darley Arabian' (the sire of Flying Childers, 1715), and later the 'Godolphin Arabian,' or Barb (1724–53). The first of these was the great-great-grandfather of the celebrated racer 'Eclipse' (foaled 1764), from whom so many winners of important races have descended. Indeed, it is not too much to say that from one or other of these horses, in most cases from all three, all horses at present on the turf trace their descent in the male line. Since the commencement of the 19th century an accurate record has been kept of the descent of all racehorses, and an attempt has been made to carry the history about a century further back.

There has been much discussion and speculation as to the kind of animal from which the domestic horse has been derived. Colonel Hamilton Smith supposed that the modern breeds have descended from about five primitive differently-coloured stocks, but this view finds no supporters nowadays; rather is it maintained that 'the similarity in the most distinct breeds in their general range of colour, in their dappling, and in the occasional appearance, especially in duns, of leg stripes and of double and triple shoulder-stripes, taken together, indicate the probability of the descent of all the existing races from a single, dun-coloured, more or

less striped primitive stock, to which our horses still occasionally revert.'

Whether the actual species thus alluded to is still living in the wild state is extremely uncertain; indeed it is held by many competent judges that no primitively wild horses now exist, the herds of horses that roam over the Russian steppes being supposed to be the descendants of animals which were once domesticated, and have relapsed into the feral state, as is known to be the case with the mustangs of South America.

The Tarpan, or wild horse of southern Russia, is a small animal, with thin, but strong, long-jointed legs, longish thin neck, and comparatively thick head, pointed ears directed forwards, and small vicious eyes. The coat in summer is close, short, and wavy, especially behind; in winter it is thick and long, forming a kind of beard under the chin; the mane thick and bushy, the tail of moderate length; the colour generally pale brown or yellowish in summer, almost white in winter. It is found in southern Russia, but (according to Radde) is absent from Central Asia, even from the north of the Gobi, where the dziggetai is found. It lives in large herds, often numbering several hundreds, subdivided into little groups or families, each presided over by a stallion, who protects his retinue valiantly, but permits no irregularities in their behaviour; young horses keep at a distance on the outskirts of the herd until they are able to undertake the cares of a family for themselves. The stallions are ever on the alert with nose and ear to detect the approach of danger, of which they give notice by a loud neigh, upon hearing which the whole herd takes to flight, sometimes disappearing as if by magic from the crafty manner in which they take advantage of irregularities in the ground. The story that they protect themselves by forming a ring with heads directed inwards has no foundation in fact, although the stallions will defend the mares and foals from impending attack. The stallions fight vigorously among themselves with teeth and hoofs, and each as he attains maturity must win his position in the herd by a series of duels. They present all the appearance of truly wild animals, and are regarded as such by the Tartars and Cossacks, who destroy them on all possible opportunities, because they are useless for taming purposes, and because they inflict considerable damage upon these horse-rearing communities by devouring their stores of hay and enticing away their mares.

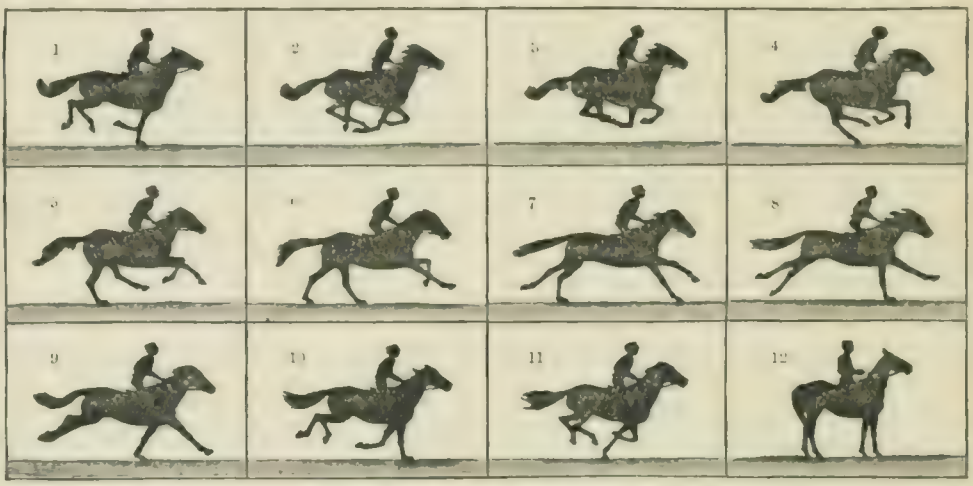
The South American wild horses, known as 'cimmarones' or 'mustangs,' are reported by Azara to be the descendants of some half-dozen individuals which were left to their own resources when the town of Buenos Ayres was abandoned about 1535. When in 1580 the town was reinstated, they were found to have increased to a very considerable number. They are of the same size as the domestic horses, but with thicker heads and legs, and longer necks and ears; all are brownish or blackish in colour. Their social system is the same as that of the tarpans. They proceed in Indian file, leaving no gaps in the series, and are avoided by travellers owing to their attempts to entice tame horses into their company, not unfrequently with success. The Indians on the pampas eat the mares and foals, and also capture a certain number in order to tame them; but the Europeans make no use of them, except perhaps to kill one when fuel is scarce in order to replenish the camp-fire with its marrow. The accounts given by travellers of these animals differ in many important particulars.

The subject of the horse's paces is one which has given rise to much controversy. It has been maintained that horses in a wild state use only the walk and gallop, the trot and others being the results of education. This question can hardly be regarded as settled even now, for the fact that quite young foals have been observed to trot beside their dams is explicable as an instance of heredity.

Six well-marked paces may be distinguished in the movements of domesticated horses—the walk, the amble, the rack or pace, the trot, the canter, and the gallop. The study of the precise movements of the different limbs in carrying out these paces is very difficult, especially in the case of those in which the motion is rapid. Marey, the French physiologist, was the first to attempt a rigorous analysis of these movements by means of apparatus. He attached to the horses' hoofs small elastic bags, connected by tubes with pointers, which made marks upon a revolving cylinder. When any one of the feet touched the ground the bag was compressed, and the pointer instantly made a corresponding mark upon the cylinder. Very valuable results were obtained by this method of study; but they need not be further detailed here, as they have been superseded by the beautiful photographic investigations of Muybridge. In these experiments the horse was made to proceed along a track in front of a row of twelve or twenty-four cameras, so arranged that, as the animal passed in succession before each of them, an instantaneous photograph of it was obtained. These pictures furnish the means of analysing the various paces, as the exact attitude of the horse is shown at very short intervals of time. In the case of an ordinary walk the horse has always two and sometimes three feet on the ground at once. The order of the succession of the footfalls is as follows: left hind, left fore, right hind, right fore; furthermore the horse is alternately supported by the two feet of the same side (laterals) and by a hind and a fore foot of different sides (diagonals); when the animal rests upon the laterals, the suspended feet appear in a side view between the supporting feet; when upon the diagonals, the suspended feet hang out one in front of and the other behind the supporting feet. These rules furnish the means of testing the accuracy of artistic representations of walking horses. The amble is a rapid walk, the length of time the feet rest upon the ground being reduced so that the body is often supported upon only one foot, and generally only on two. In the 'rack,' the fore-feet move as in a slow gallop, the hind-feet as in a trot. In the (American) 'pace,' the legs of the same side are lifted together—an action which has aptly been compared to two men running one behind the other and keeping step. The trot has been defined as a pace characterised by the synchronous movement of the diagonal limbs, though in practice the movement is rarely, if ever, quite simultaneous. It has often been maintained by experienced horsemen that a horse in trotting has always at least one foot in contact with the ground. So far, however, is this from being the case that a fast trotter is quite unsupported for more than half the distance he traverses in each stride. In the canter the order of the footfalls is the same as in the case of the walk, and the characteristic difference is due to the peculiar rhythm as well as to the final effort which propels the body at the conclusion of the stride as the fore-leg leaves the ground.

We may analyse the gallop by the aid of the accompanying reduced silhouettes copied from Muybridge, and then it will be seen that its conventional representation by artists is quite unlike any of the actual positions assumed by the moving animal. Fig. 1, it must be remembered, does not represent the start of the gallop, but merely a phase in a continuous action; the body is moving forward by impetus already acquired, and the fore-foot just leaving the ground

is adding to it. Fig. 2 is twenty-seven inches further forward; the leg which was on the ground in the last becomes so distant that it was obliged to quit the ground, and is now thrown backward; the hind-legs are gathering up and coming forwards preparatory to descending. Fig. 3 shows no further propulsion, but the hind-legs are still moving forwards. In fig. 4 one hind-leg has just touched the ground, the other is at its greatest extension; one fore-leg has come forward about half-way. In fig. 5 both fore-legs are being extended in advance; one hind-leg is pushing upon the ground, the other being brought down. Fig. 6 shows both hind-legs at work propelling the body forwards and upwards; one leg has nearly done its work, the other just begun; one fore-leg is at its maximum forward range, the other is being projected. In fig. 7 one hind-leg has left and the other is just leaving the ground; one fore-leg has reached the ground and is just beginning its stroke. Fig. 8 shows both hind-legs in the air, and the weight of the body supported upon one fore-leg. In fig. 9 one fore-leg is doing its stroke, the other is nearly ready to begin; the hind-legs remain much as in the last diagram. In fig. 10 one fore-leg has left the ground, the other is at work upon it; and the hind-legs are being brought forwards. This brings us to the end of the series,



The Horse in motion (after Muybridge).

for fig. 11 is really intermediate between figs. 1 and 2. One or two facts may be seen from these diagrams, which, though small, are accurate. The greatest propulsive force resides in the hind-legs; as the weight of the horse descends upon any one of its feet, the strain upon the limbs is so great that the pastern joint lies quite horizontally; the legs are bent when taken up and straightened in the descent; the heels strike the ground before the toes. The length of a stride in the different paces may be approximately stated as follows: walk, 6 feet; amble, 10 feet; rack, 12 feet; trot, 8 to 18 feet; canter, 10 feet; gallop, 12 to 20 feet. In the matter of speed a horse may be said to walk 4 or 5 miles an hour, trot under saddle 6 to 12 miles, or in harness 10 to 12 or even 14; as regards a gallop, the fastest records seem to be 3 miles in 5 min. 42½ sec.; 1 mile in 1 min. 43 sec. It is stated that some of the old Cleveland horses could carry 760 lb. for 60 miles in twenty-four hours, and Lawrence gives a story of a Galloway which beat the coach from London to Exeter, 172 miles, by a quarter of an hour, notwithstanding its frequent relays of fresh horses.

A few words must be devoted to the various domestic breeds of horses.

The *racer* is the one for which England is pre-eminently famous, and his origin from the combination of oriental with native blood has been above alluded to. The age of the racehorse whenever foaled is reckoned from the next 1st January, and hence it is advantageous that they should be born early in the year, so as to gain as much time as possible for development. In July or August of the following year the serious training for the two-year and three-year-old races now in vogue begins. Very few horses now race after four years old, but are used for stud purposes, at prices varying with the success they have attained on the turf.

Successful racehorses vary much in shape, some being small and neat, others tall and bony. In height they may be said to range from 15 to 16½ hands (the hand = 4 inches), though the most usual dimensions are between 15½ and 16 hands; the head should be light and well set on the neck, the ears small and pricked, the eye large, and the nostrils wide and expansible. The neck must be moderately long, and must combine muscular development with lightness; the windpipe broad and loose; the withers may be high and narrow; but it is imperative that the shoulder be sloping and muscular. The body should be moderately deep and straight; length should be given to it by the shoulders and hips; the loins must be broad and firm; the hips long and wide. The limbs ought to be well proportioned and cleanly modelled; the fetlock-joints large and the pasterns strong; the feet of moderate size, with no sign of contraction either in the heels or the frogs. The tail should be set on high. Most important of all is it that the different parts should harmonise together, and that the action should be good. Colour is perhaps of less consequence; still it is worthy of remark that for a long time the majority of winners have been chestnuts.

At his fastest speed a racehorse may cover a mile in 1 min. 43 sec.: the rate of a mile a minute currently attributed to Eclipse is, according to a competent authority, 'wildly incredible.'

In America the favourite form of horserace is the trotting-match, which appears to have originated in the prohibition of horseracing by the Puritans. The gradual evolution of the fast trotter is remark-

able. In 1828 a bet of $2000 was made and lost that no horse could trot one mile in 3 minutes. In 1852 the time required for that distance was 2 min. 26 sec.; in 1866, 2 min. 18 sec.; whilst in 1881 it had been brought as low as 2 min. 10·5 sec. In 1843 there was one horse that could do the mile in 2½ min., whilst, in 1871, 233 horses, and in 1882 no less than 1684 could accomplish this feat. See TROTTING.

The *hunter* is sometimes, but not often a thoroughbred. If this be the case, he is generally a horse that has failed to stand the test of the short rapid races, and is thereafter trained for a hunter. He differs from the racer mainly in carrying-power and endurance. A deep girth, with broad hips, a back not over long, and strong legs are his most essential characters. Jumping is a most necessary accomplishment. A five-barred gate is the ordinary limit of a leap; but a few horses have been known to clear heights between 6 and 7 feet. Yet only a few will jump 10 or 12 feet of water in the hunting-field, although horses have been known to leap a distance of 36 feet.

The *charger* ought to be 15·3 hands high. He should be a good weight-carrier, and the paces should be easy, owing to the regulation length of the military stirrups. Furthermore, as the soldier has to devote his right hand to the management of his weapon, only the left can be used for guiding his steed, which has thus to be accustomed to take its instructions from the pressure of the leg or indications given by the heel.

Harness-horses are of all degrees of value, and of varieties of race and breed, from the tall high-stepping bays, 16½ or even 17 hands in height, which draw the four-in-hands of the wealthy, to the little pony which drags a basket phaeton. A really well-matched pair of carriage-horses of good action will fetch a very high price. For horses drawing light vehicles, 15·1 hands is an average height; those preferred for coaching are taller, and the wheelers are commonly an inch higher than the leaders.

Cart-horses, like other harness-horses, are of all kinds. The enormously heavy animals which have been developed as the result of crossing the native blood with Flemish are now to be seen almost exclusively in the drays of brewers; for the most part they are bred in Lincolnshire, and are expensive to rear, and hence to purchase. The old Cleveland breed and the Suffolk Punch are said to be now extinct, and the Clydesdale is perhaps the favourite breed for this purpose at the present time.

A pony is defined as being a horse under 13 hands high; the Exmoor ponies are a valuable breed, with well-shaped head, good quarters, and powerful hocks. For small dimensions the palm is, however, carried off by the Shetland breed, the height of which is often as little as 10 hands, and not unfrequently less even than this.

In the manner of stable management it is of first-class importance that the stable itself should be in a healthy locality, and free from even the suspicion of bad smell or foul air, to both of which horses are particularly sensitive. The stalls should be roomy, and the slope of the floor no more than is needful to allow the drainage to run off; indeed an arched floor is to be preferred to a smooth slope. The stalls should be adequately lighted, but the eyes should not be strained by the use of too light paint or whitewash on the walls. Good ventilation is imperative, and should be achieved without exposing the animal to cold draughts. About 55° F. is the mean temperature to be aimed at, but it is very often impossible to keep it down nearly so low as this; in winter it is easy to keep it up, or even if this fail, the difference can be made up by clothing. In all matters pertaining to the treatment of a horse, regularity and moderation are the great secrets of success.

The food varies much with the nature of the work the horse is called upon to perform, and the means of his owner. A cavalry charger is allowed 10 lb. oats and 12 lb. hay per diem; an omnibus horse 17 lb. of mixed oats and maize, the proportions varying according to the relative prices of the two grains, and 10 lb. hay. A hunter is very commonly allowed 12 lb. oats, 2 lb. beans, and 6–8 lb. hay.

A certain moderate amount of exercise every day is necessary; nothing is worse than excessive fatigue one day and entire rest another. Two hours walking will as a rule suffice, but the needs and capabilities of different animals must be studied by those who have the care of them; in all cases it should be enough to prevent undue fidgetiness when the animal is used by his master.

HORSE-BREAKING, a process through which all young horses have to go before they are fit for work. The racehorse is generally broken when about eighteen months old, but carriage and draught horses are not broken until four-year-olds, though many farmers break their horses for light work at an earlier age. The process differs considerably in various countries, but that in use in England, though the slowest, is the most thorough, and the only one fitted to break a really valuable horse without risk. The chief requisites for a good horse-breaker are gentleness and unlimited patience, as a hasty action may undo days of work. Before the commencement of the training, the horse is accustomed to be touched by a man, and to the feel of a halter. After he is familiar with his breaker, who should on no account be changed, he is taken out with leading rein and halter until used to being led. The breaker may then commence to 'mouth' his charge—i.e. teach him to answer the pressure of the bit. This is generally done by placing a bit in the horse's mouth every day while in the stable, until he is used to the metal; he is then driven with long reins attached to his bit, by the breaker, who walks behind and turns his pupil in various directions until he answers the rein readily. After the mouthing has been thoroughly done, the horse may be mounted or harnessed and gradually accustomed to his proper work. As the majority of horses do not repay so much trouble, they have to be broken more quickly, but in the case of a high-bred animal at the risk of his courage or his temper.

In 1858–60 great attention was called to the system of an American called J. S. Rarey, who broke horses thoroughly in an hour. The essence of Rarey's method (a method published many years previously, but first introduced to the public by Rarey) was the 'casting' or throwing down of the horse, and frightening him so thoroughly that he gave no further resistance. Twenty years later much discussion was raised over an Australian system, said to differ entirely from Rarey's, but which only differed in the fact that the horse's head was tied to his tail until he fell, instead of violently casting him. Both of these systems, while of great utility in the case of a vicious horse, or where horses are plentiful and of little value, are much too severe to be undergone by a high-couraged but nervous colt, who only requires patience and gentleness to master him.

From 1784 a tax was imposed upon horses and horsedealers; in 1869 this was fixed at 10s. 6d. on each horse or mule, and £12, 10s. was charged for a dealer's license; the tax was removed in 1874.

In the year 1888 no less than 11,505 horses were imported into the United Kingdom from various parts of the world, chiefly from Germany (6667) and Denmark (2234), the average value of the

animals being £18, while 12,880 home-bred horses were exported at an average of £65. In 1891-95 from 14,000 to 23,000 were annually imported, and from 12,000 to 17,000 exported.

[Classic works on the horse by Stonehenge (new ed. 1887), Walsh ['Stonehenge'] (new ed. 1880), Youatt (new ed. 1882), Cuvier and Alex. (Paris, 1856; Haves, 1893), Sidney (new ed. 1893), Tegetmeier (1894), and Iwan (1894); on horse management, by Mayhew (1864) and others; on the anatomy of the horse, by M'Fadyean (1884) and Flower (1892); on horse-breaking, by Moreton (1888) and Hayes (1889). See also the arts. on Riding, Hippotherapy, Veterinary Medicine, Glanders, Broken Wind, Unsoundness, &c., and Hath's *Illustrated Record of Horse-racing* 1887.]

Horse, Master of the, the third great officer of the court, who has the superintendence of the royal stables, and of all horses and breeds of horses belonging to the Queen. He exercises authority over all the equerries and pages, grooms, coachmen, saddlers, and farriers, and has the appointment and control of all artificers working for the royal stables. He is answerable for the disbursement of all revenues appropriated to defray the expenses of his department; but his accounts are audited and examined by the Board of Green Cloth. He has the privilege of making use of the royal horses, pages, and servants, and rides next to the monarch on all state occasions. The office is one of great antiquity, and is considered a position of great honour. He is appointed during pleasure, by letters-patent; but his tenure of office depends on the existence of the political party in power. The salary is £2500 a year.

Horse-chestnut. See Chestnut.

Horse-fly. See Forest-fly.

Horseguards. See Guards. The name is also applied to a large public office in Whitehall, appropriated to the departments under the general commanding-in-chief. The word Horseguards is used conventionally to signify the military authorities at the head of army affairs, in contradistinction to the civil chief, the Secretary of State for War.

Horse-hair. See Hair.

Horse-hair Worm. See Hair-eel.

Horseless Carriages. See Traction-engines, Gas-engine.

Horsens, a Danish seaport on the Horsensfiord, 32 miles SSW. of Aarhuus. Pop. 12,654.

Horse-power. The word *power* is of frequent use as a scientific expression. Thus we speak of steam-power, water-power, and so on. When used in this sense it is quite obvious that reference is merely made to the nature of the store of energy in the particular motor under consideration. Again, when we speak of the total energy of a given system as the total power that it has of doing work, it would seem to be almost an insult to the mental power of our auditor to tell him in addition that by the latter phrase we mean simply total work measured in terms of any convenient unit. But it is often necessary to know the quantity of work which can be produced in a given time by a given motor. It is in this connection that the term one *horse-power* is used to denote the rate at which on the average a horse can do work per unit time, and this rate is adopted in Britain as the unit rate of working. Estimates of its numerical value necessarily differ very much; and so, in order to get a definite unit available for scientific purposes, the convention is made that the original estimate of Boulton and Watt shall be regarded as correct. The value which they gave was 33,000 foot-pounds per minute.

An ordinary rule for calculating the horse-power of a steam-engine is to divide by 33,000 the continued product of the area of the piston in inches, the pressure in pounds weight per square inch, the length of the stroke in feet, and the number of strokes per minute. Thus, by the horse-power of an engine we merely mean the numerical rate at which it can do work, expressed in terms of the above conventional unit, and this number obviously coincides with the number of horses to which the engine is equivalent as regards work in the same time. Of course the available horse-power is less than the actual horse-power as got by the above rule, because of the work which has to be done against friction in the engine itself. See Steam-engine. The term *man-power* is similarly used, being usually taken as one-eighth of a horse.

Horseracing. Horses were used for harness purposes before they were ever ridden; and chariot-races took place before horses raced under saddle. The earliest mention of chariot-races occurs in Homer (*Iliad*, xxiii.), who gives a clear description of those contests. The programme of the Grecian games included horseracing in the 33d Olympiad—i.e. the year 648 B.C.; some authorities give the time as the 23d Olympiad, though this earlier date was that of chariot-racing. Racing can thus claim a history, albeit a broken one, of nearly 3000 years, and, at the period above mentioned, it was so far reduced to a system that the horses had to be entered and sent to Elis at least thirty days before the contests began, the riders spending the month in a course of training and exercise. The 71st Olympiad, or 496 B.C., the Greeks instituted a race called the 'Calpe,' which was confined to mares, just as the One Thousand Guineas and the Oaks are now; while according to Grote's *History of Greece* it would appear that, in course of time, a certain number of races were restricted to colts of one age, so that they might not labour under the disadvantage of competing under equal weights against older horses. In the 10th century, Hugo Capet accompanied his request for the hand of King Athelstan's sister by a present of several German running horses. In the reign of Henry II. 'hackneys and charging steeds' raced at Smithfield; and under Richard I. we hear of a course three miles long, with a prize of 'forty pounds of redy golde' for the winner. To James I. the credit is commonly assigned of having placed the turf on a permanent basis. His taste for racing appears to have been fostered by an accidental circumstance. It is said that several Spanish horses, thrown overboard from the ships of the Armada, reached the coast of Galloway, and proved superior in speed to any of the native horses. The suitableness of Newmarket as a site for racing had been perceived prior to the advent of James I., who, however, lost no time in witnessing the races there, as he was present in 1605, probably for the first time, that being two years after his accession to the throne. It is worth mentioning that the king was at Lincoln races in 1607, because, on the occasion of a race taking place there on the 3d April, the king appears to have acted as a sort of clerk of the course, for he caused the track, a quarter of a mile long, to be 'raled and corded with rope and hoopes' on both sides, whereby the people were kept out, and 'the horses that ronned were seen faire' (Nichols' *Progress of James I.*). Cromwell was, to a certain extent, an upholder of racing, though perhaps he did more for breeding than for racing; but Charles II. greatly encouraged the turf, and caused races to be held near whatever place he might happen to be staying. Queen Anne, as is well known, kept racehorses, ran them in her own name, and gave plates to be run for. None of the first three Georges signalised themselves by extreme love for the turf; but it was in the twenty-third year of George III. that the Horse Tax, which *inter alia* imposed a duty of two guineas

upon every horse entered or starting for any plate, &c., was passed. Before George III.'s long reign came to an end the Prince of Wales was a prominent figure in the racing world, his career as a horse-owner dating from 1784. In 1786 the stud was sold in consequence of the pecuniary embarrassments of the prince; but, on parliament generously increasing his income, he took to racing once more. When the prince next gave up racing it was for a very different reason. His horse Escape was entered to run on the 20th and 21st at the Newmarket October meeting in 1791. On the first day it was beaten by three others; but on the second day it won easily, whereupon unpleasant remarks were made, the Jockey Club took the matter up, and Sir Charles Bunbury told the prince that if he continued to allow Chifney to ride his horses no gentleman would start against him. Rather than sacrifice his jockey he retired from the turf, though he made a modified reappearance in 1805 at the request of the Jockey Club; but the royal stable was never represented at Newmarket after 1808. William IV. naturally had no taste for racing, but as a sort of duty he kept on so that the nominations should not become void.

Since the accession of Queen Victoria the turf has not received any particular encouragement from royalty; in fact, from a purely racing view a retrograde step has been taken, as in 1886 the Queen's Plates were discontinued, and the sum they represented was increased to £5000, which has been handed over yearly to the Royal Commission on Horse-breeding, who have expended this amount in promoting the breeding of hunters and other half-bred horses. Since the time of William IV. no member of the royal house owned racehorses until the Prince of Wales bought a few.

Of all the meetings held at the present time the one at Chester is possibly the most ancient, as an order bearing date 10th January 1571 provides for the Saddlers' ball, which was of silk, being changed into a silver bell of the value of 3s. 4d., and this bell was to be the prize for the horse 'which, with speed of runninge, then should runne before all others.' In 1610 the one silver bell was changed into three 'cupps,' and the race was then known as 'St George's Race.' In 1623 'one faire silver cupp,' worth about £8, was substituted for the three cups. The Chester Cup, as at present constituted, was first run for in 1824. In Yorkshire, a horseracing county *par excellence*, races took place, according to Camden's *Britannia*, as early as 1590 in the forest of Galtres, on the east of York, the prize being a small bell with which the head of the winning horse was decorated; while Drake, in his *Eboracum*, states that, when the river Ouse was frozen over in 1607, a horserace was run upon it from the tower at Marygate end, through the great arch of Ouse Bridge, to the Crane at Skeldergate Postern. On the Knavesmire racing dates from 1709, though the first race for the King's Guineas did not take place till 1731. The St Leger has done more than anything else to make Doncaster Town Moor famous; yet, though races do not appear to have been held there so early as at Chester or Newmarket, so long ago as 1703 the Yorkshiremen pitted their horses one against another, and twelve years later the corporation of Doncaster contributed towards the stakes. In 1776 a sweepstakes was won by the Marquis of Rockingham's Allabulculia, and in 1777 by Mr Sotheron's Bourbon. In 1778 the race, the conditions for which were identical with those governing the aforesaid sweepstakes, first received the name of the St Leger, the proposal to so designate it emanating from the Marquis of Rockingham, who presided at the dinner held at the Red Lion on the entry day. A Colonel St Leger, who lived near Doncaster, originated the sweepstakes in 1776, and the race received its name in his honour. Since its first institution the conditions of the race and the weights carried by the horses have several times undergone alteration. Ascot (q.v.) has been a seat of horseracing since 1711.

Epsom (q.v.), perhaps the most popular race-course in England, first became famous in 1630 for its mineral waters. It is uncertain when racing was first practised, but it certainly existed in 1648, and in 1660 Pepys regrets his inability to be present at Banstead Downs to see a great horse and foot race. When racing at Epsom was in its infancy the usual custom was to decide a race in the forenoon, after which the whole company went into the town to dinner, and if another race was fixed for the same day, it took place after dinner. In 1780 the Derby Stakes were first instituted, and named after one of the turf's best and most influential supporters—the twelfth Earl of Derby. In point of antiquity, however, the Oaks can claim precedence over the Derby, the 'Ladies' Race' having first taken place in 1779. On thirteen occasions since the Derby was first run the winner of that race has succeeded in also winning the St Leger. Champion achieved the dual victory in 1800; and then ensued a period of forty-eight years before the feat was again accomplished by Surplice in 1848; and then, strange to say, the same horse won both races in two successive years, Flying Dutchman and Voltigeur winning in 1849 and 1850 respectively. The other double winners have been West Australian in 1853; Blair Athol, 1864; Gladiateur, 1865; Lord Lyon, 1866; Silvio, 1877; Iroquois, 1881; Melton, 1885; Ormonde, 1886; and Donovan, 1889. The St Leger has been won by the Oaks winner on six occasions—viz. Formosa, 1868; Hannah, 1871; Marie Stuart, 1873; Apology, 1874; Janette, 1878; and Seabreeze, 1888. The Two Thousand Guineas, Derby, and St Leger have been won by the same horse six times only. The first-named race was first run in 1809, but it was not till 1853 that Mr Bowes's West Australian succeeded in carrying off all three events; the other wearers of what has been termed the 'triple crown' being Gladiateur in 1865, Lord Lyon in 1866, Ormonde in 1886, Common in 1891, and Isinglass in 1893; but in 1868 Formosa, winner of the Oaks, had been previously successful in the Two Thousand, and subsequently won the St Leger. The Derby (won by Lord Rosebery in 1894 and 1895 with Ladas and Sir Visto, and by the Prince of Wales in 1896 with Persimmon) is still regarded as the great race of the year, but has hardly kept up its character. In 1867, when Hermit won, there were thirty starters, but that number has never been reached since; and it is only in the years 1869, 1872, 1874, 1878, and 1879 that the starters have numbered between twenty and thirty. In 1886 and 1888 there were nine competitors only, and a proportionate falling off is noticeable in the cases of the other 'classic' races, as they are termed. This is doubtless owing to the competition of the rich stakes offered by the executive of the gate-money meetings. In 1880 the sum of £2000, at that time the largest amount ever given to any one race, was added to the Manchester Cup. Since that time stakes have been increasing in value. The Sandown Park Eclipse Stakes, founded in 1886, was in 1889 worth £11,160; the Royal Stakes at Kempton Park, first run in 1889, was worth £9500; the Portland Stakes at Leicester, for two-year-olds, amounted to £5250; and the Prince of Wales's Stakes, for three-year-olds, at the same meeting, to £11,000. Whether these valuable prizes are for the ultimate good of the turf remains to be seen; but it is indisputable that they have materially interfered with the old-established races; so in

order to keep pace with the times it has been arranged that the Derby shall never be worth less than £5000; the race of 1890 being the first to come under the new order.

During the flat racing season of 1889 the value of the stakes competed for reached the unprecedented sum of £180,889, 18s., of which no less than £73,858, 10s. was won by the Duke of Portland, a sum very far in excess of the winnings of any other owner. Donovan alone won £38,666, 15s.; Ayrshire, £20,660; and Semolina, £9285, 8s. Mr H. Milner was credited with £21,545, 6s., and Chevalier Ginistrelli with £11,867, 11s. For yearlings of fashionable pedigree large prices are always forthcoming; in 1876, 4100 guineas were paid for Maximilian, and in 1889 Colonel North gave 4000 guineas for Garonne. But till then unheard of prices were reached when at Doncaster in 1891 Common was bought by Mr Blundell Maple, M.P., for £15,000, and an offer of £20,000 was subsequently refused. And Ormonde, sold in 1890 to a gentleman in Buenos Ayres for £15,000, was bought by Mr MacDonough of San Francisco for £30,000.

Flat-racing is altogether under the direction of the Jockey Club, and, by rule 65, any horse running at a meeting not under Jockey Club rules is thenceforward disqualified for ever from running at meetings at which the rules are in force. The Jockey Club appears to have come into existence during the reign of George II.; and the first mention of it occurs in Heber's *Racing Calendar* for 1758, in connection with a regulation passed in the March of that year directing all riders to pass the scales when they came in, under pain of dismissal. In the volume on *Racing* in the 'Badminton' series, the writer on the 'History of the Jockey Club' says that tradition assigns to the year 1750 the origin of the Jockey Club. At anyrate a room on the site of the present Jockey Club buildings was erected in 1752 on ground leased by William Erratt, a horse-dealer, to the Duke of Ancaster and the Marquis of Hastings, in trust for fifty years. The rules of racing are promulgated by this body, and are altered from time to time as circumstances may suggest. In 1889 the rules were entirely recast, and came into force with the commencement of the season of 1890. The new code confers increased responsibilities and power upon the officials, and makes several changes in the rules which had previously been in force. The 'apprentice allowance' has been done away with, and the restriction which formerly precluded foreign horses from being handicapped in England unless they had been six months in the country has been abolished. The object of the rule, which to some persons was very obnoxious, was to enable the handicapper to have some knowledge of the previous performances of the horses to which he had to assign weight. The Jockey Club is a self-constituted body, and many of its acts are neither recognised nor governed by the law of England; yet with respect to racing it discharges many important functions. No duty, however, has been more disagreeable than the one it was called upon to perform in 1889, when the stewards, Mr James Lowther, Lord March, and Prince Soltykoff, sat as arbitrators in the case of Sir George Chetwynd *v.* Lord Durham, which was an action originally brought in a court of law, but afterwards referred, with the assent of both parties, to the Jockey Club. The proceedings arose out of a speech made by Lord Durham at the Gimcrack dinner at York in 1887, in which sundry charges were made against certain persons on the turf.

According to *Bell's Guide*, 2100 horses ran in the year 1889. Of this number 988 were two-year-olds; 523 were three-year-olds; four-year-olds numbered 277; and there were 312 horses of the age of five years and upwards. In the same publication the names of 108 trainers appear; and there are 33 officials who have received licenses to act in various capacities at race-meetings. During the season of 1890, 105 meetings were fixed to take place between the 24th March and the 22d November; and the names of 195 jockeys appear in the table of winning mounts for the year 1889. The earnings of a jockey in good practice are very great. The regulation fee is £5 for a winning mount and £3 for a losing one; but it is comparatively seldom that a jockey's remuneration is confined to the minimum scale. Bets are often made for him; retaining fees run to £1000 or more; presents are almost invariably given for successful riding; and in some cases the stakes of great races have been promised to jockeys if they win. It is not in England alone that horseracing flourishes. Many meetings are held in France, the chief races run there being the Derby, first run in 1836; the Oaks, in 1843; and the Grand Prix. Important meetings are held in Germany and at Vienna; while racing is becoming popular in Italy. Some of the great English races have been won by French horses. Thus, the Goodwood Cup was won in 1853, 1855, 1857, and 1873 by Jouvence, Baroncino, Monarque, and Flageolet respectively. Mortemer won the Ascot Gold Cup in 1871, and Henry in the succeeding year; while Boiard in 1874 and Verneuil in 1878 must be added to the list. In 1876 Chamant and Jongleur between them carried off the Middle Park Plate, Dewhurst Plate, and Criterion Stakes; Camellia won the One Thousand in 1876, and Chamant the Two Thousand in 1877; Enguerrande and Camellia ran a dead-heat for the Oaks in 1876, and the St Leger fell to Rayon d'Or in 1879; and, in addition to these victories of French horses, Fille de l'Air carried off the Oaks in 1864, and Gladiateur, as already mentioned, won the Two Thousand, Derby, and St Leger in 1865. The long list of successes gained by the French horses in 1876, coupled with the fact that so few French races were open to English horses, caused the late Lord Falmouth to give notice to the Jockey Club in that year that he would bring forward a motion to the effect that no foreign horses should be allowed to compete in England until the bar to the admission of English abroad was removed. The idea, however, did not find favour, and the motion was allowed to drop. The successes of American horses date back to 1857, in which year Prioress won the Cesarewitch for Mr Ten Broeck, that gentleman's Starke being the winner of the Goodwood Stakes in 1859 and of the Goodwood Cup in 1861; Iroquois was the Derby winner of 1881, and of the Prince of Wales's Stakes (Ascot) and of the St Leger as well; while Foxhall took the Cesarewitch and Cambridgeshire in 1881, and the Ascot Cup in 1882. In more recent years Wallenstein and Passaic achieved some successes. Hungary has been represented on English racecourses by Kisber, the Derby winner of 1876, and by Kincsem, who won the Goodwood Cup in 1878. The entries for the Derby of 1890 included two Australian colts sent over by the Hon. James White. Although trotting is the national sport in America, the galloping thoroughbred is somewhat growing in favour. Russia has its races; the turf exists as an institution in the colonies, at the Cape, and in India; and racing, for a few years prior to 1889, advanced so quickly into popular favour at Buenos Ayres that the export trade to that place was a very brisk one, and an English racing man or two and a trainer were tempted to go over to the Argentine Republic. The native trainers, however, were successful over the Englishmen.

The rules of racing in England provide that in

each day's racing there shall be two races of 1 mile or upwards, not being selling races; and no race shall be run over a less distance than 5 furlongs. In the opinion of those who have the interests of the turf at heart, there are too many of what are colloquially known as '5-furlong scrambles,' which make shifty horses and bad jockeys. The rule as to the number of races in a day of 1 mile or upwards is of course strictly complied with; but it is at comparatively few meetings that a 2-mile race is witnessed. At Ascot there are several events run over 2 miles; the Gold Cup course is 2½ miles; and that for the Alexandra Plate 3 miles; while the Goodwood Cup distance is also 2½ miles, and the Cesarewitch is run over 2¼ miles.

The weights carried by racehorses are assigned in various ways. In some races, like the Derby, Oaks, and St Leger, which are confined to horses of one age, all carry the same weight; but if, as in the Derby, both fillies and colts are eligible to compete, the fillies have a sex allowance of 3 lb. Next come the weight-for-age races, open to horses of different ages, in which case horses of the same age carry the same weight, the younger ones less than older ones. Thirdly comes the handicap, which, owing to the field it opens to fraud, is said to have been responsible for many of the malpractices which occasionally take place in connection with the turf: it was brought into fashion by the promoters of race-meetings sometimes finding it difficult to provide sufficient sport for the spectators and the owners of horses. When racing was in its infancy all horses, which were, however, usually five or six years of age, carried the same weights, so that if a four-year-old happened to start he met maturer horses on disadvantageous terms; and, when a horse had made a name for himself, no others were entered against him. Weight-for-age races (in which horses of six years old and upwards give weight, according to a scale laid down, to younger competitors) and give-and-take plates were gradually introduced, the give-and-take plate being one in which a certain weight, say 9 stone, was assigned to horses of a certain size, 14 hands, for example. Horses above that size carried 7 lb. extra for each inch, while those who fell short of that measurement were allowed 7 lb. for each inch below 14 hands. Handicaps were known in the 18th century, but it was not till about 1818 that they figured often in the programmes of race-meetings. Since then they have increased in number.

The handicaps at the meetings of which the Jockey Club stewards are also the stewards of the meeting are made by the official handicapper, who is a salaried official of the Jockey Club; but his services are retained for many other meetings, for which he obtains extra remuneration from those employing him. In racing it is sought to equalise the chances of the different horses by apportioning to each the weight which, in the opinion of the handicapper, will bring them together, his aim being to bring about a dead-heat by all the horses competing. The conditions of a handicap are duly published, and the date at which the entries close is notified. The handicapper then proceeds to consider the powers of the horses, and assigns to each horse the weight he thinks it ought to carry, and in due course the several owners know the handicapper's estimation of their horses by the publication of the weights in the *Racing Calendar*. Those who think that the handicapper has entertained an exaggerated estimate of their horse's powers can save further cost in the way of forfeit by declining to accept; and then the next piece of intelligence published in the *Sheet Calendar* is the 'acceptances,' as they are called—in other words, the names of the horses whose owners are *primâ facie* satisfied with their chances, though it by no means follows that all those that are 'left in,' as the phrase runs, will start for the race. It frequently happens that the horse to which is allotted the top weight is among the non-acceptors, not always because his owner thinks that the horse cannot give away the required weight, but because he is occasionally unwilling for him to carry so much for fear of breaking him down, of which there is obviously more chance under 9 stone than under 6 or 7 stone.

Moreover, the conditions of nearly every handicap provide that a horse winning a race after the publication of the weights shall carry a penalty, which must be added to the weight originally allotted by the handicapper; and the incurring of this penalty is often the reason of horses not starting. When the top weight or weights do not accept, the highest weight accepting is raised to that which was originally the maximum of the handicap, and then, assuming the maximum to have been 9 stone, a notice appears in the *Calendar* to the effect that, the highest weight accepting being 8 stone 4 lb. (or whatever the impost may have been), it has been raised to 9 stone, and the others in proportion. The minimum weight to be carried in a handicap or any other race is fixed by the rules of racing at 6 stone, and by the 27th rule the top weight to be allotted in a handicap shall not be less than 8 stone 12 lb. For a year or two prior to 1889 a rule was in force that apprentices who had not ridden three winners might claim a 5-lb. allowance so long as the weight to be carried did not fall short of the minimum weight permitted. The object of the rule was to encourage the employment of lads not yet out of their time who gave promise of riding well; but after the regulation had been in force for a short time it was urged that the 5-lb. allowance upset the work of the handicapper; so, when the rules of racing were revised by the Jockey Club in 1889, the section authorising the apprentice allowance was excised.

To decide upon the weights horses shall carry is no easy task. The handicapper must be a regular attendant at race-meetings and able to form his own judgment on what he sees; for the position a horse may occupy at the termination of a race is not necessarily any criterion of his true form. He may be out of condition; or, when his jockey finds he cannot win with him, a horse is almost invariably eased and finishes seventh or eighth when he might have been third or fourth; and the handicapper must also possess sufficient perception to see when an attempt is made to throw dust in his eyes. Even so astute a man as the late Admiral Rous occasionally made mistakes; and whoever may for the time being occupy that difficult position must abandon all hope of pleasing everybody.

See J. C. Whyte, *History of the British Turf* (2 vols. 1840); James Rice, *History of the Turf* (2 vols. 1879); W. Day, *The Racehorse in Training* (1880), and *The Horse and how to Breed Him* (1883); Hare, *History of Newmarket* (1884); *History of Racing and Steeplechasing*, 'Badminton' series, Duke of Beaufort, editor (1886); Touchstone, *Pedigree, Description, and History of Celebrated English and French Racehorses, 1791 to 1885*; an anonymous *History of Racing* (1862); Joseph Osborne, *The Horse-breeder's Handbook* (1881), and *Guide to the Stud-book* (Epsom, 1889); *The General Stud-book*, published every five years (vol. xvi. 1889); Weatherleys' *Portraits of Celebrated Racehorses* (4 vols. 1887); Taunton, *Portraits of Celebrated Racehorses* (4 vols. 1889); Weatherleys' yearly *Racing Calendar*; Ruff's *Guide to the Turf*; R. Black, *Horse Racing in England* (1894). See also STEEPLECHASE, TROTTING, BETTING.

Horse-radish (*Cochlearia Armoracia*), a perennial herbaceous plant, belonging to the natural

order Cruciferæ and to the same genus as scurvy grass. It possesses the same antiscorbutic properties as the latter, but is better known popularly on account of its use as a condiment with roast-beef. It is highly stimulant, exciting the stomach and promoting the secretions, particularly that of urine. Its virtues depend upon a volatile oil similar to oil of mustard. The oil contains about 30 per cent. of sulphur to its other elements, and is recognised as one of the most powerful antiscorbutics known. Horse-radish is a native of south-eastern Europe, has long been cultivated in British gardens, and is naturalised in some parts of England and Ireland. For its perfect cultivation it requires very deeply-worked soil, from which it is very difficult to eradicate, as the smallest bit of root not removed will emit a bud. Cases of fatal poisoning have several times occurred through the ignorant mistaking the roots of Monkshood (q.v.) for those of horse-radish. The former are powerfully poisonous; but there is no resemblance between the two plants in any respect. The roots of horse-radish are long, tapering, cylindrical, with a cream-coloured skin. Those of monkshood are short, irregular in shape, blunt at both ends, and have a nut-brown skin. The root-leaves of horse-radish are from 9 to 18 inches long by from 4 to 6 inches broad, entire, but often toothed on the margins. Those of monkshood are roundish in outline, divided to the base into five to seven deeply-cut, linear, finely-pointed segments. The flowers of horse-radish, which are sparingly produced in Britain or the United States, are borne on branching stems about 2 feet high, and composed of four pure white spreading petals. Monkshood bears its flowers freely in handsome racemes, at the extremities of usually simple or unbranched stems; the colour is deep blue, and the unopened flower strongly resembles a helmet or hood.

Roots of Horse-radish (*a*) and Monkshood (*b*).

Horse-radish Tree. See Ben (Oil of).

Horseshoeing. In olden times horses generally went unshod, as they now do in many eastern countries; but our macadamised roads and paved streets, fast paces and heavy loads, would speedily wear away the stoutest hoofs, and a rim of iron has accordingly been long in use as a protection. In style and pattern the horse's shoe varies almost as much as his master's boot, and like it, when badly made or unskilfully fitted, produces serious inconvenience, and even leads to accidents and diseases. When the feet are strong and properly managed nothing is better than a plain shoe of tolerably uniform breadth and thickness, carefully fashioned to the shape of the foot. But many good authorities prefer what is called a seated shoe, which has a level part for the crust to rest upon, and within that the inner half of the shoe towards the sole surface is bevelled off. This seated shoe is thus wider than the plain shoe, and hence affords greater protection for a weak or flat sole. For faulty or diseased feet special forms of shoes are made. In all healthy feet the shoe should be fitted to the foot, and not, as is commonly done, the foot cut to fit the shoe. Another frequent error must be avoided—keeping the shoe short and spare at the heels. For roadsters the toe of the fore-shoes should be slightly turned up, which greatly obviates tripping. The hind-shoes are generally thickened and sometimes turned down at the heels. The number of nails required must vary somewhat with the weight of the shoe and the soundness of the horn; five is the minimum, nine the maximum. It is important, however, that the shoes be firmly held on by as few nails as possible. In a saddle-horse with sound feet three on the outside and two on the inside should suffice to hold a well-fitted shoe. Horses for heavy draught

A sound Fore-foot prepared for the Shoe:
A, A, the heels of the crust; B, the toe cut out to receive the clip; C, C, the quarters of the crust; D, D, the bars as they should be left, with the full frog between them; E, E, the angles between the heels and bars, where corns appear; F, F, the concave surface of the foot; G, G, the tuberous heels; H, the cleft.

are generally shod in Scotland with tips and heels, which afford increased firmness of tread and greater power, especially when dragging heavy loads. To preserve the foot in a sound state the shoes should be removed every month. When the shoe is carefully taken off, the wall-surface on which it has rested should be rasped, to remove any ragged edges and any portions of adhering nails. Having for a month been protected from the wear to which the exposed portions of the foot are subjected, it will probably have grown considerably, and in a stout hoof will require to be cut down with the drawing-knife, especially towards the toe. Except in very strong feet and in farm-horses working on soft land, the surface of the sole uncovered by the shoe seldom requires to be cut. It is the natural protection of the internal delicate parts, and must be preferable to the leather and pads often artificially substituted for it. The bars must likewise remain untouched, for they are of great service in supporting weight; whilst the tough, elastic frog must be scrupulously preserved from the destructive attacks of the knife, and allowed uninjured to fulfil its functions as an insensible pad, obviating concussion, and supporting weight. When the shoe is put on and the nails well driven home, they should be broken off about an eighth or even a sixteenth of an inch from the crust, and

hammered well down into it. This obviously gives the shoe a much firmer hold than the usual practice of twisting off the projecting nail close to the crust, and afterwards rasping down any asperities that still remain. When the shoe is firmly clinched the rasp may be very lightly run round the lower margin of the crust just where it meets the shoe, to smooth down any irregularities; but all further use of the rasp must be interdicted. The clinched nails if touched will only have their firm hold weakened; nor must the upper portions of the crust, which blacksmiths are so fond of turning out rasped and whitened, be thus senselessly deprived of those external unctuous secretions which render the unrasped foot so tough and sound and so free from sandcracks. The hoof cannot be too dry and tough. From time to time various attempts have been made to fix shoes to horses' feet without nails; and a shoe has been invented, which is said to have answered the purpose; but in the opinion of many the system is still immature, and requires to be more extensively tested. An interesting exhibition of horseshoes, ancient and modern, was held in London in March 1890.

See *Notes on the Shoeing of Horses*, by Lieut.-col. Fitzwygram; a paper on 'Horseshoeing,' by Miles, in the *Journal of the Royal Agri. Soc.* (reprinted by Murray); and Williams' *Veterinary Surgery*.

Horsetails (*Equisetum*), a genus of herbaceous plants which in itself constitutes the singular natural order Equisetaceæ. The family is distinguished from all others by the leafless, articulated, and whorled stems and branches, which in structure and character closely resemble some of the larger fossil plants now extinct. They are separated from all other plants also by their fructification, which is an ovoid or oblong terminal cone-like spike, consisting of several whorls of peltate, shield-shaped, short-stalked brown or black scales, under each of which are six or seven capsules filled with minute spores, and opening on the inner side. Under the microscope there will be seen attached to the base of each spore four thread-like filaments, somewhat club-shaped at the apex, rolled spirally round the spore when moist, but uncoiling elastically when dry.

The species of horsetail are few in number, although widely diffused in the temperate and colder regions of the northern hemisphere, becoming rare in the tropics. Nine species occur in Britain, usually in moist or marshy places, but they adapt themselves easily to a great variety of stations, and are almost ineradicable where they obtain a footing in either field or garden. Diuretic and other medicinal properties have been ascribed to them, but apparently on slight grounds. They all contain a large quantity of silica in the cuticle of their stems, which has rendered them useful in polishing metals, marbles, ivory, cabinet-work, &c. *E. hyemale* is the most favoured species for these purposes, and it is imported in considerable quantity from Holland under the name *Dutch Rushes*.

Horsham, a market-town of Sussex, near the source of the Arun, 26 miles NNW. of Brighton and 35 SSW. of London. The noble parish church, Early English in style, was restored in 1865; other buildings are the corn exchange (1766), grammar school (1540; rebuilt 1840–57), &c. Brewing, tanning, iron-founding, and coach-building are carried on. Horsham returned two members of parliament from the 14th century till 1832, and one down till 1885. East of the town is St Leonard's Forest, and 2 miles NW. Field Place, Shelley's birthplace. Pop. (1871) 6874; (1891) 8637. See Histories of Horsham by Howard Dudley (1836) and an anonymous writer (1868).

Horsley, Samuel, an English prelate, was the son of a clergyman, and was born at London in 1733. He was educated at Westminster School and Trinity Hall, Cambridge; and in 1759 succeeded his father as rector of Newington, in Surrey—a living which he held for thirty-four years, though he also enjoyed in the interval many other preferments, including the archdeaconry of St Albans (1781). In 1767 Horsley was elected a Fellow of the Royal Society; in 1774 he published his *Remarks on the Observations made in the late Voyage towards the North Pole, for determining the Acceleration of the Pendulum*; and two years afterwards he issued proposals for a complete edition of the works of Sir Isaac Newton, which, however, did not make its appearance till 1785. But the grand event in his career was the controversy with Priestley, in which he displayed remarkable learning and acuteness, somewhat marred by intolerance and contemptuous bitterness. The work that excited the controversy was Dr Priestley's *History of the Corruptions of Christianity*, among which corruptions was included the orthodox doctrine of Christ's uncreated divinity. Horsley reviewed the work with great severity in his charge delivered to the clergy of his archdeaconry, May 22, 1783. Priestley replied the same year; and in 1784 Horsley retorted in seventeen *Letters*. These were, in return, met by a new series from Priestley. After a silence of eighteen months Horsley again replied, and in 1789 collected and published the whole that he had written on the subject. His services were rewarded with the bishopric of St Davids in 1788, with that of Rochester in 1793, and with that of St Asaph in 1802. He died at Brighton, October 4, 1806. Other works besides sermons, were on Hosea, the Psalms, biblical criticism, and classical subjects.

Horsley, Victor Alexander Haden, F.R.S., born at Kensington, 14th April 1857, is a son of John Callcott Horsley, R.A. (born 1817), and as a physiologist is distinguished for his work in the localisation of brain functions and in the treatment of Myxœdema. He studied at University College, London, has contributed largely to medical journals, was Croonian lecturer to the Royal Society, and Fullerian professor (1890–93) at the Royal Institution, and is professor of Pathology in University College. He is a member of many societies at home and abroad, and was secretary to the Royal Commission on Hydrophobia. He is a strenuous defender of necessary experiments on living animals.

Hort, Fenton John Anthony, D.D. (1828–92), born in Dublin, graduated at Cambridge as third classic, and was a fellow of Trinity (1852–57), and from 1878 Hulsean professor of Divinity. With Bishop Westcott he constructed a revised Greek text of the New Testament. See his Life and Letters (2 vols. 1896).

Hortense. See Bonaparte, Vol. II. p. 288.

Hortensius, Quintus (114–50 B.C.), Roman orator, largely devoted himself to the defence of aristocratic offenders, such as Verres. His countless speeches are known to us only by the merest fragments.

Horticulture. See Gardening.

Hortus Siccus. See Herbarium.

Horus. See Egypt, Vol. IV. p. 234.

Horvath, Michael (1809–78), Hungarian historian, was professor of Hungarian in Vienna, Bishop of Csanad, and, in the revolutionary war, minister of public instruction. He returned from exile in 1867, and is remembered for his *History of Hungary to 1823* (1842–46), and its continuations, *Twenty-five Years of Hungarian History*,

ns,' 2s (2 vols. 1863), and *History of the War of Independence in Hungary* (3 vols. 1865).

Hosanna, used as an expression of praise, is really a prayer—'Save, we pray' (through Gr. *hōsanná*, from Heb. *hoshaánnā*).

Hosea (Heb. *Hōshēa*, LXX. *Osee*; Vulg. *Osee*), the first in order of the twelve minor prophets, is nowhere mentioned in the Old Testament except in the book which bears his name. From this source we learn that he was a citizen of the kingdom of Israel (see i. 2, where 'the land' is plainly the northern kingdom, and vii. 5, where 'our king' is the king of Samaria), that his father's name was Beeri, and that he prophesied during, and apparently also after, the reign of Jeroboam II.—i.e. from about the middle of the 8th century B.C. The fourteen chapters which preserve to us all that we know of what must have been a long period of prophetic activity may plausibly be believed to have been edited by himself and given to the world in writing towards the close of his life. The first three derive a special interest from their autobiographical element. The remaining eleven consist of a series of prophecies, mostly of a threatening character, relating to the kingdom of Israel. The details of these present many exegetical difficulties, and it is impossible to determine with any certainty what may have been the precise circumstances under which each oracle was originally delivered. Some relate to the still outwardly prosperous times of Jeroboam II., and others, most likely, to the troubled years that immediately followed. They point generally to an exceedingly dissolute internal condition of society, which ultimately drove the prophet to the verge of despair, and out of which he saw no escape save in the destruction of the kingdom, to be followed by a final restoration brought about in some unexplained way through the sovereign love and mercy of Jehovah. The question of greatest interest to interpreters of the Book of Hosea is that connected with the narrative of the first three chapters, in which the prophet relates how the experiences of his married life furnished him with his prophetic message. In the opening words we read of his marriage to Gomer bath-Diblaim, by whom he had three children to whom he gave the significant names, Jezreel ('Jehovah shall sow'), Lo Ruhamah ('not pitied'), and Lo Ammi ('not my people'). Her profligate conduct after marriage led to a separation, but, in obedience to a divine call, he took her back; and in the ultimate victory of marital love over a wife's infidelity he saw the token and the promise of the final triumph of Jehovah's grace over Israel's sin. According to the modern view, first suggested by Ewald, further elaborated by Wellhausen (in 4th ed. of Bleek's *Einleitung*) and Robertson Smith, and now adopted by most scholars, Hosea, i. 2, is to be interpreted in the light of such a passage as Jer. xxxii. 8, where we have a clear instance of recognition of a divine command only after the deed has been accomplished, and there is therefore no necessity for supposing that Hosea was aware of the profligate character of Gomer bath-Diblaim when he married her, or indeed that her profligacy had declared itself at that time. Earlier interpreters either took the passage literally and argued that a marriage which otherwise would have been contrary to all sound moral feeling was justified by a divine command, and that the repulsive elements in it magnified the obedience of the prophet; or they treated it as an allegory, without much attempt to explain how a proceeding which would be objectionable in fact ceases to be so in the realms of fiction.

[illegible] W. R. [illegible], *[illegible]* 1882. [illegible] special commentaries on the book by Simon (Hamburg and Gotha, 1851), Wünsche (Leip. 1868), Nowack (Berlin, 1880), and Cheyne (new ed. Cambridge, 1889). See also the commentaries on the minor prophets generally—Ewald (*Propheten*, vol. i.; Eng. trans. 1876), Hitzig, Keil (Eng. trans. 1868), Reuss (*Hist.* 1876), Pusey (1860); and, for homiletical purposes, Schmoller in Lange's *Bibelwerk* (Eng. trans. 1874).

Hoshangabad, chief town of Hoshangabad district (area, 4437 sq. m.; pop. in 1891, 529,945), in the Central Provinces of India, stands on the Nerbudda River, 40 miles SSE. from Bhopal. It does a lively business in English piece-goods, cotton, grain, &c. It has been in British hands since 1817, and is a military station. Pop. 16,490.

Hoshiarpur, capital of a district in Punjab, near the foot of the Siwalik Hills, 90 miles E. from Lahore. It is the seat of an American Presbyterian Mission. Pop. 21,552.

Hosiery, in its most limited sense, refers to the manufacture of stockings (hose); but in its more general application it comprises all knitted goods, whether made by hand or by machinery. The use of hose or stockings originated in the cold countries of the north, and probably the first were made of skins, and subsequently of cloth. Illuminations in ancient MSS. show that these nether garments were worn by the Anglo-Saxons and the Normans. The art of knitting was invented (it is supposed in Scotland) in the 15th century. Certain it is that knitted stockings found their way to France from Scotland, and led to the establishment of a guild of stocking-knitters, who chose for their patron saint St Fiacre of Scotland (really an Irish monk of the 6th century, the patron of gardeners). In 1589 William Lee, of Woodborough, Nottinghamshire, entirely altered the hosiery trade by inventing the knitting-frame, or stocking-frame; and, although he did not live to enjoy much benefit himself from it, it soon became a very important feeder to the commerce of Great Britain.

The first improvement of marked importance on Lee's machine was the ribbing apparatus invented by Jedediah Strutt in 1758. This consisted in adding a second series of needles, with an arrangement for working them, to Lee's machine, which could only make a plain, not a ribbed, web. Sir Marc I. Brunel invented, in 1816, a circular knitting-frame, to which he gave the name of *Lyrotuer*. This produced a tubular web, and was a meritorious machine, but it did not come much into use till it was improved, about 1844, by Claussen of Brussels. His further modification of it in 1847 caused it to be widely adopted, and it has received various improvements since. Several important improvements in hosiery machines are due to Townsend, chief among them being a tumbler or latch needle, patented by him in 1858, which is now largely employed in certain kinds of knitting-machines, especially those for fancy hosiery and for domestic use. Fig. 1 shows two views of this

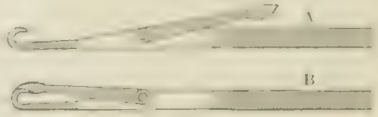


Fig. 1.

needle. A represents it with the hinged latch or tongue folded back on the stalk so that the hook may catch the thread. B shows the latch closed on the point of the hook so that it may freely pass a new loop of thread through the last-formed loop. The latch is moved by the loops of thread or yarn during the action of the machine. The modern

form of Lee's needle is shown in the other figures. The most prominent name among the improvers of hosiery machines in comparatively recent times is that of William Cotton of Loughborough. Between 1851 and 1869 he devised arrangements both for narrowing and widening the fabric, and in conjunction with Attenborough made a number of alterations for the better on the general arrangements of the parts of the knitting frame. Some of the best hosiery machines driven by steam-power now in use are on Cotton's system.

The names of two Americans appear in the list of those who have contributed to the advancement of knitting machinery. In 1858 an English patent was taken out by W. C. Gist for a circular machine, which, by using several feeders instead of one, enabled striped work with as many as sixteen colours to be made at once. Another English patent was taken out in 1877 by Almet Reid for a circular knitting-frame for making automatically articles of many different shapes, in which the loops or stitches are so locked together as not to unravel when cut or torn.

A knitted fabric of one colour consists of one continuous thread instead of a warp and a weft thread as in weaving, and the knitting done by a machine is exactly of the same nature as that done by hand. With the aid of the accompanying illustrations a brief description will suffice to explain the principle on which a knitting-machine or stocking frame works. A perspective sketch of a

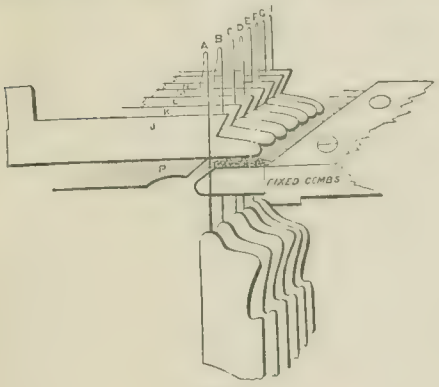


Fig. 2.

part of a division of the machine is given in fig. 2. The hooked needles (Lee's) are shown at A, B, C, D, E. The 'sinkers,' J, K, L, M, N, are thin plates of steel, which have a backward and forward motion, each sinker passing between two needles. When the sinkers are moved to the left of their position in the figure a space occurs between them and the needles, along which the thread or yarn is laid. As the thread proceeds along the face of the needles the sinkers one by one advance and thrust the thread between them, thus forming a row of loops, after which the sinkers retire.

All the needles act simultaneously and in the same way; but to make the action of the machine more easily understood, figs. 3, 4, and 5 show the movements of a single needle. Fig. 3 represents, in side elevation, the position of a sinker, a comb, and a needle, at the moment when the needle has sunk between the sinkers, till the newly-formed loop of thread, O, enters the hooked portion or open eye. The needle, continuing its descent, is rocked forward till, as shown in fig. 4, the 'beard' of the hook comes against the 'presser bar' P, which presses for a moment the point of the beard into a groove on the stem, and so forms a closed eye round the loop O. The needle, in further descending, pulls this loop through the last-formed loop

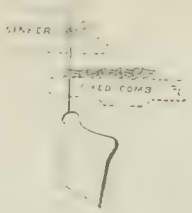


Fig. 3.

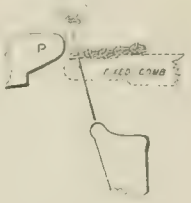


Fig. 4.

of the knitted fabric. It is in this closing of the hook to enable the one loop to be drawn through the other that the great ingenuity of Lee's invention lies. Fig. 5 shows the new loop just pulled through, and then the needle, rocking forward in the direction of the arrow, ascends, while the loop slips down its stem. The next loop is pulled through in the same way. The explanation just given of the motion of one needle applies to all the needles, as they are fixed in line on a rigid bar.

Fig. 5.

Fig. 6 shows an enlarged plan of five rows of loops, in which the triangular dots, Nos. 1, 2, 3, 4, 5, 6, 7, and 8, in the last-formed row are the needles with the thread-carrier, T, in the position where it commences to lay the thread in front of them. The knitted fabric is wound upon a roller as fast as it is formed. It would take up too much space to describe the arrangement for narrowing or widening the fabric, to bring it to the shape of a stocking for example. This is called 'fashioning.' The web, however, is often not shaped in the process of knitting, but cut, when finished, into any form required, as is done with ordinary cloth.

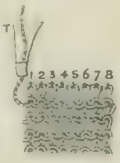


Fig. 6.

Some of the most improved modern knitting-frames work at a great speed. One with six divisions of 480 needles each (a usual size) has in all 2880 needles. Each of these forms loops at the rate of 90 in a minute, so that the whole machine forms 259,200 loops in a minute. An expert hand-knitter, working with wires, can hardly do more than 100 loops in a minute.

Numerous hosiery or knitting machines, varying much in their details, are now made both for factory work and for domestic use. In the volumes for 1886 and 1889 of the *Textile Manufacturer*, published at Manchester, several of the best of these are illustrated and described. To the pages of that journal we are indebted for the diagrams given in this article. For the history of the knitting-frame, see Felkin's *Machine-wrought Hosiery and Lace* (1867).

Nottingham and Leicester, especially the former, are the chief centres of the hosiery manufacture in the United Kingdom, but it extends into the adjoining counties. It is also extensively carried on in France, Germany, and other continental countries. In the United States hosiery factories are in active operation in New York, and in five or six neighbouring states. The materials used for hosiery are cotton, wool, and silk; and the number of different kinds of articles made, including stockings, gloves, shawls, hats, bonnets, and

all kinds of underclothing, amounts to thousands. The result of recent improvements in the machinery for the manufacture of hosiery is shown by the fact that in 1854 it cost fully six shillings to knit a dozen pairs of stockings by the hand knitting frame then in use; whereas the cost at the present time by power knitting machines does not exceed one shilling and tenpence per dozen pairs.

Hospice, the name given to the pious establishments for sheltering travellers, maintained by monastic persons, usually in connection with monasteries. One of the best known in inhospitable regions is that on the Alpine pass of Great St Bernard (see ST BERNARD), of which mention is made as early as 1125. Travellers are lodged and boarded gratuitously, but those who can, deposit a suitable present in the alms-box. Similar establishments are found on the Simplon, the Little St Bernard, and the Bernina.

Hospitallers, in the Roman Catholic Church, are charitable brotherhoods, founded for the care of the poor and of the sick in hospitals. They follow for the most part the rule of St Augustine, and add to the ordinary vows of poverty, chastity, and obedience, that of self-dedication to the particular work of their order. The Knights of St John of Jerusalem (see below) and the Teutonic Knights (q.v.) were both originally hospitallers. The Knights Hospitallers of the Holy Spirit were founded at Montpellier in 1198 by Guy of Montpellier, and the hospitallers of Our Lady of Christian Charity at Paris in the end of the 13th century by Guy de Joinville. And numerous similar orders have been established since then.

THE ORDER OF THE KNIGHTS OF ST JOHN OF JERUSALEM, otherwise called the Knights of Rhodes, and afterwards of Malta, a celebrated military and religious order of the middle ages, originated about 1048 in a hospital, dedicated to St John the Baptist, which some merchants of Amalfi built at Jerusalem for the care and cure of pilgrims to the Holy Sepulchre. After the conquest of Jerusalem by the crusaders under Godfrey of Bouillon in 1099, the hospital servants were joined by many from the Christian army, who resolved to devote themselves to the service of the poor and sick pilgrims. Gerard, the first rector of the hospital, formed them into a regularly-constituted religious body, bound by the vows of poverty, chastity, and obedience, and subject to the jurisdiction of the Patriarch of Jerusalem. Pope Pascal II. gave his sanction to their institution as an order in 1113. Raymond du Puy, the successor of Gerard, extended the activity of the order by pledging its members to protect pilgrims on the roads from the sea to the Holy City. Soon afterwards the order became predominantly military: the Hospitallers were sworn to defend the Holy Sepulchre to the last drop of their blood, and to make war upon the infidels wherever they should meet them. Having become military as well as religious, the order was recruited by persons of high rank and influence, and wealth flowed in from all quarters. Various hospices, called commanderies, were established in the maritime towns of Europe as resting-places for pilgrims, who were there provided with the means of setting out for Palestine. These branch establishments also collected the revenues of the order, and received candidates for admission to its ranks. After the conquest of Jerusalem by Saladin the Hospitallers established themselves at Acre in 1191. Soon afterwards a bitter rivalry sprang up between them and the Knights Templars, which finally set them in battle array one against the other in 1259, when victory inclined to the former. The Hospitallers clung with desperation to Acre, the last Christian stronghold in Palestine; but after a terrible siege by the ruler of Egypt, they were compelled to sail away to Cyprus (1291), where the king of the island gave them an asylum for some years.

In 1185 Frederick Barbarossa took the order under the protection of the empire. In the following century the title of 'master' was changed by Pope Clement IV. into 'grand-master.' The brethren consisted of three classes, knights, chaplains, and serving brothers, these last being fighting squires, who followed the knights in their expeditions. The order was in the 12th century divided into eight 'languages'—Provence, Auvergne, France, Italy, Aragon, England, Germany, and Castile. Each 'language' embraced several grand-priories, and under these again were a number of commanderies.

In 1310 the knights, under the grand-master Fulk de Villaret, in conjunction with a party of crusaders from Italy, captured Rhodes and seven adjacent islands from the Greek and Moslem pirates, and carried on from thence for more than two hundred years a successful war against the Turks. During this period the Hospitallers were the owners of nearly 19,000 manors in Europe, and to these 9000 more were added on the suppression of the Knights Templars in 1312. In 1523 they were compelled to surrender Rhodes to Sultan Solyman, and retired to Candia (Crete). In 1530 Charles V. assigned them the island of Malta, with Tripoli and Gozo. Tripoli was surrendered in 1551 to the corsair Dragut, who in 1565 laid siege to Malta, which the Hospitallers had strongly fortified. Dragut was beaten off at the end of four months with the loss of 25,000 men. The knights continued for some time to be a powerful bulwark against the Turks; but after the Reformation a moral degeneracy overspread the order, and it rapidly declined in political importance. In 1798, through the treachery of some French knights and the weakness of the last grand-master, Hompesch, Malta was surrended to the French. The lands still remaining to the order were about this time confiscated in almost all the European states; but, though extinct as a sovereign body, certain branches of the order, with more or less just claims to legitimate succession, have continued during the 19th century to drag on a lingering existence in Italy, France, Spain, England, and Germany. After 1801 the office of grand-master was not filled up, till in 1879 the pope appointed a grand-master for the Italian and Bohemian 'languages.' In their military capacity the Hospitallers wore red surcoats over their armour. The badge worn by all the knights was a Maltese cross, enamelled white and edged with gold. The motto of the order was 'Pro fide,' with the later addition of 'Pro utilitate hominum.'

There are two modern associations which ascribe their origin to the original order—the Brandenburg 'Johanniterorden' and the English order of the Knights of St John. The former, a direct descendant of the German 'language' of the old legitimate order, was reorganised in 1853, and did good service in the campaigns of 1866 and 1870. In England the property of the old order was confiscated in the first year of Elizabeth's reign, and the order itself was dissolved and declared to be illegal by Henry VIII. in 1541. Nevertheless the 'language' of England was resuscitated in 1827; the revived society has its headquarters at St John's Gate, Clerkenwell, London. Its efforts are purely philanthropic: it distributes charity to convalescents who have just left hospital, maintains cottage hospitals and convalescent homes in the country, and an ophthalmic hospital at Jerusalem. It has founded the street ambulance system, and was chiefly concerned in the origination of the Red Cross Society.

See Histories of the order by Bosio, Del Pozzo, Vertot

(Eng. 1728), Taaffe (1852), Porter (1883), De Salles (1889); and Delaville de Roux's *Les Archives, la Bibliothèque, et le Trésor de l'Ordre de St-Jean à Malte* (1883).

Hospitals are so called from the medieval *hospitia*, or more properly the class of hospitals established very generally for the reception and relief of lepers, whose malady was one of the scourges of Europe. These leper hospitals were very commonly in England and in Scotland called 'Spitals;' hence the frequency of such names of places as Spital, Spitalfields, &c. The leper hospitals and other kinds of the old hospitia disappeared with the improvement of society, and substitutes for them on a broader scale began to be established in the modern form of hospitals. Of public establishments under this general designation there are now, as is commonly known, three distinct classes—hospitals for the reception and treatment of the sick and hurt, hospitals for the board and education of children, and hospitals for the reception and permanent board of poor old persons of both sexes. As in the present work the more remarkable hospitals receive some notice under their respective heads, we need here only offer a few general observations.

Hospitals for the sick and hurt are in some parts of England and Scotland termed Infirmaries. Under whatever designation, institutions of this kind are now established in all parts of the civilised world. They are supported in most cases on a principle of charity, but in some special instances from the funds of the state or the civic municipalities. The primary or more important object of all such institutions is to mitigate bodily suffering, whether that arises from natural or accidental causes, in which respect they are indispensable as a refuge to all who are unable to pay for private medical or surgical aid, or as a convenient means of succour on emergencies to persons of every rank and degree of opulence. While such is the main object of these benevolent institutions, they are also serviceable as schools for medicine and surgery; as such, no university, at which these and kindred branches of learning are taught, can be said to be complete without the adjunct of a well-organised hospital, where professors can practically educate their pupils by pointing out varieties of disease and injuries, and exemplifying methods of treatment. Hence the best specimens of hospitals are found in university towns—as in London, Paris, Edinburgh, and some other cities famed as schools of medicine and surgery. The older of the London hospitals are St Thomas's (1553), St Bartholomew's (1546), and Bedlam or Bethlehem (1547), to which may be added the Westminster (1719), Guy's (1725), the Lock (1746), St George's (1733), the London (1740), the Middlesex (1745), and University College (1833). A considerable accession to the number took place in the reign of George II., when society became alive to the value of such institutions. It was at this period that the Royal Infirmary of Edinburgh was established (1730). The antiquity of British hospitals sinks into insignificance in comparison with that of some institutions of this kind on the Continent. The Hôtel Dieu in Paris, which is alleged to be the most ancient hospital in Europe, was founded in the 7th century, and, long known as the Maison Dieu, received the benefactions of successive sovereigns.

In London, Paris, and other large seats of population, besides the general hospitals, there are now lying-in hospitals, ophthalmic hospitals, consumptive hospitals, children's hospitals, &c.—each with its peculiar accommodation and staff of officials. Convalescent Hospitals (q.v.) are a valuable adjunct to ordinary hospitals for the sick. Independently of these there are hospitals for the treatment of mental maladies, of which Bethlehem and St Luke's in London, and the establishments in Paris, known as Hospices, are examples. To this class of institutions belong Lunatic Asylums (q.v.), also asylums for the reception and treatment of naturally imbecile children; these last, though in operation for some time in France and Switzerland, being but of recent establishment in Great Britain. To these must be added the isolation hospitals for the treatment of smallpox, scarlet-fever, and other forms of infectious diseases, which have been established in recent years by every energetic sanitary authority out of the rates. Besides these institutions under civil administration are those hospitals which are maintained by the English, French, and other governments for the military and naval services. In the United States, where every medical college has its own hospital, or the right to teach in the wards of public institutions, there are also many hospitals or asylums for inebriates (see INEBRIATES), for opium-users, and those addicted to the use of other narcotics (see also FOUNDLING HOSPITALS, AMBULANCE).

Until the middle of the 19th century the organisation and management of hospitals and the nursing of the sick in Britain and in most parts of Europe were, except in some few instances, extremely defective. Public opinion was then aroused on the question, and certain principles were laid down on hospital construction and hospital nursing which have been recognised and adopted to a greater or less extent since that time. These principles may be briefly summed up as follows under the three heads: (1) Construction, (2) Administration, (3) Nursing.

(1) *Construction.*—The first object is to obtain pure air in and around the building. The purity of air around will depend upon the site. The soil should be clean and dry; the position should admit of free circulation of air untainted by surrounding sources of impurity or damp. The number of sick who can be placed on a given site depends on the form of the buildings in which they are to be placed. It is now considered that more than 100 patients should never be under the same roof. And less is better. This has led to the pavilion form of building being adopted—blocks connected by corridors. *Two* floors only of patients' wards are admissible, but hospitals with only one floor for the ward accommodation are now universally recognised as best. More than three is insanitary. Hospital buildings consist (*a*) of the wards for the reception of the sick, and their appurtenances; these necessarily form the basis of the design; subsidiary to these are the operating theatre, &c.; and where there is a medical school instructional accessories have to be provided. (*b*) The buildings for administration—i.e. for lodging the staff, the kitchen, stores, and dispensary, should be always subordinate to the question of the accommodation for sick. In some hospitals extra out-patients' departments are provided. These should never be placed under the same roof with the wards for the sick.

(*a*) The first principle of the ward unit is that the ward and ward offices should be self-contained within one door commanded by the head-nurse's room, so that at any moment she may know where every patient is. The size of the wards has to be somewhat guided by economy of administration, so as to enable the largest number of patients to be nursed by a given number of nurses. The limit of the ward is practically the number who can be efficiently nursed under one head-nurse. Each ward may have subsidiary to it one or two small wards for bad cases.

The ward appurtenances consist partly of nursing

accommodation and partly of offices for patients. The nursing accommodation includes a bedroom for the head nurse; a serving room in which food can be warmed, drinks and extra diets made, and linen kept and aired, hot water obtained, poultices, &c. made; also a nurses water-closet near. The head-nurse's room should be so placed as to enable the nurse to exercise constant supervision over the ward and the patients. The offices for patients comprise a lavatory for the patients, a bath room with a movable bath, which bath-room and lavatory should be large enough for minor surgical operations, and water-closets in the proportion of about 3 to 10 per cent. of the number of patients—the general hospital for acute cases, mostly in bed, requiring the lesser number—one or more slop sinks, a place for keeping ejecta of patients for medical inspection. These appurtenances should be cut off from the ward by ventilated lobbies, and should be always warmed and ventilated independently of the ward.

The form of the ward should be such as to enable the air to be renewed with the greatest facility. Experience in this climate shows that the windows are the best appliance for complete renovation of the air. For this purpose they should be on opposite sides of the ward, and the wards should not exceed from 20 to 28 feet in width. There should not be above two rows of beds between the windows. The rectangular form enables these conditions to be best fulfilled in the case of large wards. Where the wards are not intended to contain more than from four to eight patients a circular form of ward has been in some cases found unobjectionable; but as it is a principal object in hospital construction to provide a large wall space in proportion to the floor and cubic space per bed in the wards, and as the rectangular form affords the largest, and the circular form the smallest wall space in proportion to the area of the ward, it is evident that the rectangular form is that best adapted to sanitary requirements.

(*b*) The subsidiary accommodation should be so arranged as not to interfere with the purity of air in or around the wards. The fewer places in and about the ward the better. Not only the best arrangements, but what use will be made of them, has to be considered. The sleeping accommodation for nurses should be so placed as to ensure purity of air in the dormitories, and complete quiet for the night-nurses to sleep by day.

(2) *Administration* is intended to enforce economy so far as it is consistent with the provision of requirements for the sick. It is usually in the hands of a governing body, which issues all regulations after consultation with professional advisers; it controls the expenditure and raises the funds to support the hospital. The governing body acts through its treasurer, secretary, and steward for the general discipline and control of expenditure. The well-being and cure of the patients is directed by the professional staff of medical officers, which consists of visiting physicians and surgeons and of resident medical officers, who control the treatment of the patients under their direction and in the absence of the visiting medical officers. The nursing of the sick is under a trained matron or lady superintendent, who should be the head of all the women employed in the hospital.

(3) *Nursing* the sick and injured is performed usually by women under scientific heads—physicians and surgeons. Nursing is putting us in the best possible conditions for nature to restore or to preserve health—to prevent or to cure disease or injury. The physician or surgeon prescribes these conditions—the nurse carries them out. Health is not only to be well, but to be able to use well every power we have to use. Sickness or disease is nature's way of getting rid of the effects of conditions which have interfered with health. It is nature's attempt to cure—we have to help her. Partly, perhaps mainly, upon nursing must depend whether nature succeeds or fails in her attempt to cure by sickness. Nursing is therefore to help the patient to live. Nursing is an art, and an art requiring an organised practical and scientific training. For nursing is the skilled servant of medicine, surgery, and hygiene.

Nursing proper means, besides giving the medicines and stimulants prescribed, or applying the surgical dressings and other remedies ordered, (1) the providing and the proper use of fresh air, especially at night—i.e. ventilation—and of warmth or coolness; (2) the securing the health of the sickroom or ward, which includes light, cleanliness of floors and walls, of bed, bedding, and utensils; (3) personal cleanliness of patient and of nurse, quiet, variety, and cheerfulness; (4) the administering and sometimes preparation of diet; (5) the administration of remedies. See NURSING.

Fever Hospitals, distinct from those for the treatment of surgical and ordinary medical cases, are essential for securing the isolation of patients in infectious diseases; hospital ships or floating hospitals have been found extremely valuable for securing complete isolation in cases of virulently infective disorders such as Small-pox (q.v.).

Poor-law Infirmaries.—Since 1870 poor-law or parish infirmaries for the sick and infirm, who used to be harboured (not treated) in workhouses and nursed by paupers, have been built, and are served by trained nurses. Some difference exists between the essentials for general hospitals and for poor-law infirmaries—the latter having no medical schools, no visiting or resident medical officers, except the resident medical superintendent and his assistant, no accidents or operations. The large majority of patients in them are chronic, not acute, cases, and incurables. A smaller nursing staff in proportion is needed. Some few of the best and largest have now training-schools for nurses. Since 1875 Metropolitan Board and Unions, supported also by the rates, have been built near London for fevers, for small-pox, for idiots and imbeciles, &c.

Lying-in Hospitals.—The lying-in hospitals require special consideration. The entire use of wards for this purpose appears to be very dangerous to the patients. Indeed this would seem to be the reason why there are fewer cases of ills from this cause in workhouse infirmaries than in the ordinary lying-in hospital, and why the lying-in at home is safer than either.

In Paris, where this subject has been much considered, two forms have been tried with good results. In one each patient has a small ward to herself, with its scullery or service-room attached, opening through a covered porch into an open veranda. After each confinement the ward is cleaned and lime-whited before further occupation. In these wards fatal results have been very rare. Another form is to have a ward which can hold two or more beds, in one of which the patient is brought for the delivery, and after a few hours she is wheeled out in the bed into a large ward where she remains with other patients who have also been delivered. With this plan also, where the delivery ward is cleaned and lime-whited at short intervals, and where two delivery wards are in use alternately, one always standing empty, fatal results have been rare. Instances of both forms of lying-in hospitals are not unknown in the United Kingdom. But it would be well if they were more universal.

Children's Hospitals must be provided with establishments for bathing, playing indoors and out,

large garden grounds, gymnastic grounds and halls, in and out of doors; the gymnastics should be under a professor, and out-patients should be always admitted. A 'sister' must superintend each of all these places. Singing in chorus is to be taught. It is a matter of universal hospital experience that intermingling of ages is essential. If you have a children's hospital, let the age of admission include fifteen years, especially on the female side. In all hospitals (in a child's hospital much more than in others) the patient must not stay a day longer than is absolutely necessary. Every child's hospital ought to have a *convalescent* branch at a distance; if possible by the sea. Sick children can never be left alone for a moment. One might almost say a nurse is required for every child. This is why in a general hospital it is much better for the children to be mixed with the adults; and, if they are judiciously distributed, it does the woman in the next bed as much good as it does the child, or the man as it does the little boy. If there *must* be a children's ward in a general hospital, let it be for the infants.

Convalescent Hospitals must be as like a home and as unlike a hospital as possible. A string of detached cottages is the best, admitting of extension by the addition of similar parts. Convalescent wards in a general hospital are not good; nor are day-rooms. Healthy open position and climate must be carefully selected. The convalescents are only to sleep at night in their rooms, while in the day they are 'out and about,' or occupying themselves—the men in the garden, the women at household work. But there must be strict discipline. There must be two small wards for relapses next the 'sister's' room, in the centre cottage. The convalescent beds may be divided by curtains, to be pulled far back in the day-time. A wash-hand stand to be permitted within—no lavatory. Three or four beds a good number for each convalescent room. Men and women should have separate cottages, and only meet at meals. Every hospital should have its convalescent branch, and every county its convalescent home.

Hospitals for Incurables should admit all diseases certified by competent medical judges to be hopelessly incurable—except mental diseases, which require special arrangements. One well-known hospital for incurables excludes epilepsy because it frightens the other patients; avoids, if possible, congenital and infantile disease; prefers patients of and above middle age; and excludes children and all under twenty years. The cases treated by incurable hospitals are principally cases of chronic rheumatism, gout, paralysis, and various affections which cripple the limbs, &c. These hospitals, while treating cases within their walls, are no doubt productive of great benefit to the community; but the system of granting pensions from the hospital funds to out-patients is very questionable.

A Samaritan fund is generally provided to assist poor patients leaving hospitals who may be deficient in clothing or other necessaries. In public *Dispensaries* (q.v.), at stated hours, medical advice and medicines are given gratis to applicants; in recent years provident dispensaries have been established, supported by subscriptions, entitling the subscriber to advice and medicine. Valuable establishments are those called in France *Maisons de Santé*—private hospitals for the reception and treatment of patients who are able and disposed to pay a small sum for board and medical or surgical attendance.

Hospital Sunday. On one Sunday in the year it is the practice for churches of almost every denomination in London and throughout the provinces to have special collections for the support of the hospitals of the country. In London the movement originated in 1873; Aberdeen claims to have begun the practice in 1764.

See Antiseptics, Disinfectants, Germ, Hygiene, Infection, Medicine, Nursing, Pyæmia, Surgery; Burdett, *Hospitals and Asylums of the World* (4 vols. 1893); Billings and Hurd, *Hospitals, Dispensaries, and Nursing* (1895); Mouat and Snell, *Hospital Construction and Management* (1884); Clifford Smith on *Administration of Hospitals* (1863); Douglas Galton, *Construction of Hospitals* (1870), and *Healthy Hospitals* (1893); Wylie, *Hospitals* (New York, 1877); the present writer's *Notes on Hospitals* (new ed. 1863), and *Lying-in Institutions* (1871); and such reports as those of the Commissions on the Sanitary Condition of Barracks and Hospitals (1863), on Regulations affecting the Sanitary Condition of the Army and Organisation of Hospitals (1858), and on Smallpox and Fever Hospitals (1882).

Hospodar, a Slavonic title once commonly given to the governors of Moldavia and Wallachia, whereas the king of Roumania is now known under the native Romanic title of *Domnu*. Lithuanian princes and Polish kings also bore the title.

Host (Lat. *hostia*, 'a victim'), the name given in the Roman Catholic Church to the consecrated bread of the eucharist. It is so called in conformity with the doctrine of that church that the eucharist is a 'sacrifice,' in the strict sense of the word, though, in the common language of Catholics, 'host' is used for the unconsecrated altar-bread, and even so occurs in the offertory of the Roman missal. The host in the Latin Church is a thin circular wafer (in Old English, 'syngeing cake') of unleavened bread, made of the finest flour, and bearing stamped upon it the figure of the Crucifixion or some emblematic device, as the Lamb, or the letters IHS. These are the 'points' and 'figures' forbidden in the first book of Edward VI. In all ancient liturgical rites the consecrated host was broken before being consumed by the priest. In the Roman Church the celebrant, who uses at mass a larger host than that reserved for other communicants, first breaks it into two halves, and then from one half detaches a fragment which he drops into the chalice. In the Greek and other oriental churches, as well as in various Protestant communities, the eucharist is celebrated in leavened bread; and one of the grounds of separation from the West alleged by Michael Cerularius was the western practice of using unleavened bread. The use of unleavened bread is founded on the belief that Christ can only have used such bread when instituting the eucharist at the Paschal feast. Luther followed the Roman Church in this point, but did not break the host. It was decided by the Privy-council, in the Purchas case (1871), that the use of the wafer is forbidden in the Church of England. The elevation of the host is the act by which the priest immediately after pronouncing the words of consecration raises the host with both hands above his head, whilst the server tinkles his bell to call attention to the ceremony, that the congregation may adore Christ present.

Hostage, a person given to an enemy as a pledge for the proper fulfilment of treaty conditions. Formerly the evasion of the terms of the treaty by one of the contracting parties used to be regarded as entitling the enemy to put to death the hostages that had been given up to them. The shooting of Archbishop Darboy (q.v.) and his fellow hostages in 1871 was the most execrable crime of the Paris Communists.

Hostilius, Tullus, the third of the legendary kings of Rome, succeeded Numa Pompilius in 670 B.C. He it was who made the famous arrangement by which the combat of the Horatii with the Curiatii decided the question of supremacy between Rome and Alba in favour of the former. He fought

against Fidenæ and Veii, and conquered them; and destroyed Alba, and removed the inhabitants to Rome, giving them Mount Celius to dwell on; and carried on war against the Sabines. At length the gods grew wrathful with him for his love of war and his neglect to worship them, and Jupiter Elicius consumed him and his house with fire about 638 B.C. According to Niebuhr and Arnold, there are glimpses of a distinct personality in the legend of Hostilius, unlike those of Romulus and Numa, which are merely personifications of the two principal stages of a nation's growth.

Hotbed, a bed of fermenting vegetable matter, usually surmounted by a glazed frame, employed in gardening for cultivating melons and cucumbers, the rearing of tender annuals, propagating stove and greenhouse plants by cuttings, seeds, or grafting, forcing flowers, &c. It is an inexpensive means for obtaining a high temperature in a limited atmosphere, accompanied with genial humidity charged with nutritious gases, which is very beneficial to plants. Formerly it was an indispensable adjunct to the garden, but the almost universal employment of hot water as a heating agent for horticultural purposes has latterly greatly circumscribed its use. The materials used in making hotbeds are stable-dung, leaves—those of the oak and beech, being especially suitable, are frequently mixed with the dung—tanners' bark, spent hops, and the waste of jute, cotton, hemp, and flax, all of which must be allowed to pass through the first violent stages of fermentation in order to eliminate the deleterious gases they contain before being built up into the bed. The size of the bed is regulated by the degree of heat required for the purpose in view. A bed of stable-dung with or without leaves intermixed, four feet thick, will for some time after it is built maintain a temperature of from 75° to 90°, which is sufficient for most purposes. As the fermentation declines the bed cools down, but heat is again readily increased by adding fresh material to the sides of it. The bed should be made a few inches wider and longer than the frame that is to be placed upon it, and from 6 to 9 inches higher at the back than the front to secure a better angle for light. See also PLANT-HOUSE.

Hotchpot (the same word as *Hotch-potch* in the culinary sense), a phrase used in English law to denote that, where one child has already received an advancement out of the father's estate, that child must bring such portion into hotchpot before he will be allowed to share with the other children, under the statute of distributions, after the father's death. In other words, a child who has got money from the father to place him in business, &c., must treat that as a payment to account of his share at the father's death. The eldest son is not required to bring into hotchpot the land which he takes as heir. A similar, but not identical, doctrine exists in Scotland under the name of collation.

Hotch-potch, a Scottish dish, may be defined as a kind of mutton-broth in which green peas take the place of barley or rice. *Hotch-potch* or *Hodge podge* is a corruption of Old English *hoch-pot*; Fr. *hochepot*; from Dutch *hutspot* (*hutsen* being 'to shake in the pot').

Hot Cross Buns. See CROSS BUNS.

Hotel (Fr. *hôtel*, Old Fr. *hostel*, Lat. *hospitale*), a superior kind of inn (see INN), like the old English *hostel*. The often palatial hotels that have sprung up since the introduction of railways are too well known to require notice. One point of difference between the European and the American systems is that under the former, except in the case of a *table d'hôte*, the charge is for each dish ordered, while under the American plan a fixed price is charged for every meal. The modern French word is still used for the house of a rich or distinguished man, or for a public building, such as the *Hôtel de Ville* (see MUNICIPAL ARCHITECTURE), as well as for inn or hostelry.

Hothouse. See PLANT-HOUSE.

Hot Springs, a town of Arkansas, 56 miles WSW. of Little Rock, is surrounded by fine mountain scenery, and is much frequented as a summer-resort. It has over fifty thermal springs, ranging in temperature from 95° to 148° F. Pop. 8086.

Hotspur, HARRY. See PERCY.

Hottentots, the people who were in possession of the greater part of what is now Cape Colony when it was first visited and colonised by Europeans. The Hottentots were so called by the earliest Dutch settlers, puzzled at their strange harsh faucal sounds and clicks, Hottentot or Hüttentüt signifying a quack in Frisian or Low German. It is a somewhat misleading name, as it is popularly used to include the two distinct families distinguished by their native names: the Khoikhoi, the so-called Hottentot proper, and the Sān (Sā) or Bushmen, between whom little charity exists. Again, among the Khoikhoi proper, the terms Hottentots, Hottentots proper, or Cape Hottentots are often applied to the remnants of the tribes who formerly lived around Capetown; while the inhabitants of Griqualand West, of the South Kalihari, and of Great Namaqualand are distinguished by their tribal names as Griquas, Namaquas, Koras or Koranas, as if they were not as much Hottentots as the Khoikhoi of Cape Colony. The Bushmen are hunters; the Khoikhoi, nomads and sheep-farmers. At the present time the so-called Hottentots proper may number about 17,000; and the half-breeds, mostly employed in the Cape Colony, may number probably 100,000. The majority of the former and almost all the latter class are now semi-civilised, and copy the habits, customs, dress, and vices of the European colonists. In general they are of medium height, not very robust in build, and have small hands and feet. Their skin is a pale brown colour; their hair woolly, growing in curly knots; their cheek-bones very prominent; and their chin pointed. The women are sometimes distinguished by certain organic peculiarities, and often have an enormous development of fat, especially in the breasts and hinder-parts. Their principal characteristics in former days were indolence and hospitality. Their favourite amusements were feasting, dancing, smoking, and singing. The men were herdsmen, and not fond of war, though they liked to hunt. The women, although held in high esteem, performed all the manual labour. Their dwellings were huts of wood and mats, or tents, disposed in circles, and easily transportable. Their manner of living was entirely patriarchal: each tribe or division of a tribe had its own chief. The method of perpetuating family names was that the sons took their mother's family name, whilst the daughters took their father's.

Their language embraced three principal dialects—the Nama, spoken by the Namaquas; the Kora, spoken by the Koranas; and the Cape dialect, now almost, if not entirely, extinct. Owing to its use of suffixes for expressing the declensions of nouns and the conjugations of verbs, the Hottentot language has been classed by Bleek, Lepsius, and other scholars with the Hamitic family of speech. This view is, however, controverted by Fr. Müller, Hahn, and Von Gabelentz, who maintain that the Hottentots and Bushmen are allied peoples, the aboriginal inhabitants of the greater part of South Africa. The association of the Bushmen with the Hottentots rests, however, upon little more than the

common possession of a few verbal roots and the common use of some harsh faucal sounds or 'clicks' in their manner of speech. These 'clicks' are four in number—a dental sound, usually represented by the sign |; a palatal, by ≠; a lateral, by ||; and a cerebral, by !. All the Khoikhoi idioms are distinguished by monosyllabic roots ending in a vowel, and the use of pronominal elements as suffixes for the purpose of forming derivatives. They possess no prefixes. One striking feature is a decimal system of counting.

They have both sacred and profane poetry, and hymns of both kinds are sung accompanied by the so-called reed-music or reed-dances, performed on reed or bark pipes. The sacred hymns are generally prayers, invocations, and songs of praise in honour of the supreme being Tsũi||goab, the beneficent deity Heitsi-eibib, and the Moon; while the profane reed-songs or dances deplore the fate of some dead chief or hero, or are sarcastic lessons to some one who has done something unpopular. They are often given by way of welcome to some guest worthy of honour, and in every large kraal there is a bandmaster, whose business it is to drill the young boys and girls in this music. Dr Hahn compares its effect to the harmonium. The chief divinities of the Khoikhoi, as has been seen, are the supreme being Tsũi||goab, who lives in the Red Sky; another beneficent being, Heitsi-eibib, considered as an ancestral deity, who came originally from the East; and ||Gaunab, an evil spirit, whose malignant influence has to be averted by prayers and charms, which furnish employment to troops of professional sorcerers. The mythology is rich, but singularly confused and difficult of interpretation. It contains also repulsive features enough, but not more so than the old Greek. Much more might have been known had well-meaning missionaries been more sympathetic or intelligent. Beyond the hymns spoken of, the popular imagination has originated, or at least retained, a great number of fables, as well as legends, proverbs, and riddles. One persistent feature in these is a strong inclination to personifications of impersonal beings. Speech and reason are freely imputed to the lower animals, and human-like agencies employed freely as causes of celestial and other natural phenomena. The first to give examples of these was Captain (afterwards Sir) James Alexander in his *Expedition of Discovery into the Interior of Africa* (2 vols. 1838). More were brought to light by Krönlein and other scholars, and in 1864 Dr W. H. I. Bleek gave a good selection in his *Reynard the Fox in South Africa: Hottentot Fables and Tales.*

For the language, see the grammars by Tindall (1871), Hahn (1870), Fr. Muller (*Grundriss der Sprachwissenschaft*, vol. ii. 1877), and Bleek (1862-69). For the people, see Dr Gustav Fritsch, *Die Eingeborenen Süd-Africas* (1872); and Dr T. Hahn's *Tsuni-goam: the Supreme Being of the Khoi-Khoi* (1882).

Hottentots' Bread. See DIOSCOREACEÆ.

Hottonia. See WATER-VIOLET.

Houdin, ROBERT (1805-71). See CONJURING.

Houdon, JEAN-ANTOINE, the greatest French sculptor of the 18th century, was born at Versailles, 20th March 1741. He was of humble origin, his father holding office in a nobleman's house. He was a born sculptor, and at the age of thirteen had already attracted notice. An untrammelled eclecticism was ever Houdon's most prominent characteristic. In 1761, when he was but twenty, he won the *prix de Rome*, and in Rome he threw himself with enthusiasm into the study of the antique. Herculaneum and Pompeii had not long been brought to light. All Winckelmann's works were published during Houdon's sojourn in Italy. Ten years he remained in Rome, and there executed the colossal figure of St Bruno, the founder of the order of the Chartreuse, of which Pope Clement XIV. said that it would speak did not the rules of its order enforce silence. On his return to France the usual official honours were conferred upon him. In 1777 he was received into the Academy; in 1796 he was elected member of the Institute; and he was appointed professor at the École des Beaux-arts in 1805. Apart from his work his life was singularly uneventful, though he once visited America under the escort of Franklin, to execute a monument in honour of Washington (1785). Nor did he altogether escape from the troubles of the Revolution. An allegorical figure from his hand, entitled 'Sainte Scholastique,' involved him in the heinous charge of desiring to perpetuate the worship of the saints. But on pleading that his statue only represented Philosophy, he was acquitted. Towards the end of his life his intellect failed him, and death came as a release, 16th July 1828. Houdon is perhaps the most conspicuous figure among the artists of his time. His mastery over his material was complete. So great were his technical skill and adroitness that they sometimes carried him beyond the bounds of his art. He had essayed all styles without sacrificing his personality, and, while much of his work has an almost classical simplicity, it was generally his method (in portraiture at least) to obtain a resemblance by an infinitude of details. It is a little strange that his 'Écorché' should be the most widely known of his works. For it was in portraiture that his greatest triumphs were achieved. Turgot, Rousseau, Voltaire, Diderot, Franklin, Washington, Lafayette, Mirabeau, Napoleon, and Mdlle. Arnauld are a few of the great men and women whose features he has perpetuated for us. In 1890 a statue of him was erected at Versailles at a cost of 10,000 francs.

Houghton, RICHARD MONCKTON MILNES, LORD, was born of a good old Yorkshire family at Fryston Hall, Pontefract, 19th June 1809. His father, 'single-speech Milnes' (1784-1858), of Fryston, Bawtry, and Great Houghton, declined the chancellorship of the exchequer and a peerage; his mother was a daughter of the fourth Lord Galway. Educated by private tutors at home and in Italy, he went up to Trinity College, Cambridge, where he graduated M.A. in 1831, and where he was a leader in the Union (then 'cavernous, tavernous'), and one of the famous band of 'Apostles.' From 1837 till 1863 he represented Pontefract, first as a Conservative, but latterly as an independent Liberal; and then he was called by Lord Palmerston to the Upper House, of which for a score of years he was 'the only poet.' In 1851 he married a daughter of the second Lord Crewe. She died in 1874; and he himself, having three years before had a passing attack of paralysis, died suddenly at Vichy, 11th August 1885. A Mæcenas of poets (and of poetasters), he got Lord Tennyson the laureateship, soothed the dying hours of poor David Gray, and was one of the first to recognise Mr Swinburne's genius. His own poetry is always respectable, and some of the shorter pieces were in their day exceedingly popular—'Strangers Yet,' for example, and the pretty lyric whose refrain is 'The beating of my own heart Was the only sound I heard.' Besides this, Lord Houghton—the 'Mr Vavasour' of Beaconsfield's *Tancred*—was a traveller, a philanthropist, an unrivalled after-dinner speaker, and Rogers' successor in the art of breakfast-giving. He went up in a balloon, and down in a diving-bell; he was the first publishing Englishman who gained access to the harems of the East; he championed oppressed nationalities, liberty of conscience, fugitive slaves, and the rights of women; he carried a bill for establishing

reformatories (1846); and he counted among his friends Hallam, Tennyson, Thackeray, Dickens, Carlyle, Sydney Smith, Landor, Cardinal Wiseman, Heine, Thirlwall, and a host of others.

Lord Houghton's works include *Memorials of a Tour in Greece* (1833); *Poems of many Years* (1838); *Memorials of a Residence on the Continent* (1838); *Poetry for the People* (1840); *Memorials of many Scenes* (1843); *Palm Leaves* (1844); *Life, Letters, and Remains of Keats* (2 vols. 1848); *Good Words and Good Manners* (1859); *Monographs, Personal and Social* (1873); and *Collected Poetical Works* (2 vols. 1876). See an article by T. H. S. Escott in the *Fortnightly* for September 1885, and the Life by Wemyss Reid (2 vols. 1890).

Houghton-le-Spring, a town in the county, and 6½ miles NE. of the city, of Durham. Its rapid growth is mainly due to the extension of neighbouring collieries. The fine cruciform parish church contains the cinque-cento altar tomb of Bernard Gilpin (q.v.), who founded a grammar school here, and among whose successors were Peter Heylin and Archbishop Sancroft. Pop. (1851) 3224; (1891) 6746.

Hound, a name applied to dogs used in hunting. The true hound, such as the Bloodhound, the Foxhound, and the Staghound, hunt only by scent. In this division may also be included the Basset-hound (a short-legged dog used in unearthing foxes and badgers), the Beagle, and the Harrier. The greyhound and the deerhound run by sight alone, and are not hounds in the correct acceptance of the term. See also FOX-HUNTING.

Hound's-tongue (*Cynoglossum*), a genus of plants of the natural order Boragineæ, of which there are many species, all of a coarse appearance, with small flowers. The Common Hound's-tongue (*C. officinale*) is a native of Europe, Asia, Africa, and North America; not uncommon in some parts of Britain, especially near the sea-coast. It has soft downy leaves, of a dull green colour, purplish-red flowers, and a stem about two feet high.

Hound's-tongue (*Cynoglossum officinale*).

Its odour is very disagreeable. The root was formerly administered in scrofula, dysentery, &c., and is said to be anodyne. It is also one of the pretended specifics for serpent-bites and hydrophobia.

Hounslow, a town of Middlesex, 10 miles W. by S. from London by road, was formerly a place of much importance in the old coaching days, it being the first stage out of London on the Bath and Southampton roads. As many as 800 horses were then maintained here, 500 coaches passed through daily, whilst a most extensive business in posting was carried on. With the opening of the railways, however, the place gradually declined, and at the present time it contains but little of interest. Its three churches are all modern, the oldest, rebuilt in 1835, having been formerly the chapel of a priory. West from Hounslow, stretching for 5 miles along the road, and in 1546 containing an area of 4293 acres, was Hounslow Heath, the scene of many military encampments, and notorious in the annals of highway robbery. It is now for the most part enclosed. Near to the town are extensive gunpowder-mills and cavalry and militia barracks, and at Kneller's Hall, once the residence of Sir G. Kneller, the painter, are the quarters of the Royal Military School of Music. Pop. (1851) 3514; (1871) 9294; (1891) 12,873, of which the barracks contained over 1000.

Hour, a measure of time equal to $\frac{1}{24}$th part of an astronomical day or to $\frac{1}{12}$th part of a natural day (excluding the hours of night or darkness). See DAY, and TIME; and for the hours in Catholic usage, see BREVIARY. *Hour circles*, in astronomy, are any great circles which cut the poles.

Hour-glass, an instrument for measuring intervals of time. It is made of glass, and consists of two bulbs united by a narrow neck; one of the bulbs is nearly filled with dry sand, fine enough to run freely through the orifice in the neck, and the quantity of sand is just as much as can run through the orifice in an hour, if the instrument is to be an hour-glass; in a minute, if a minute-glass, &c. The obvious defects of this instrument are the expansion or contraction of the orifice produced by heat or cold, and the variations in the dryness of the sand, all of which produce deviations from the true measurement of the time. The hour-glass was almost universally employed in churches during the 16th and 17th centuries. In several of the churches in England hour-glass stands of elegant workmanship are still to be seen.

Houri, the name of the beautiful damsels who, according to the Moslem faith, await with their companionship in Paradise the true believers after death. See MOHAMMEDANISM.

Housatonic River rises in Massachusetts, flows through Connecticut, and enters Long Island Sound near Bridgeport. In its course of nearly 150 miles it affords water-power to many manufacturing villages.

House, in point of law, is an Englishman's castle, though not a Scotchman's. In other words, when a man shuts himself up in his own house no bailiff can break open the door to arrest him, or seize his goods for debt, in England, and no court can give such power, except in the case of a writ of attachment for contempt of court or a writ of *habere facias possessionem* (the writ by which a judgment for the recovery of land is commonly enforced). In Scotland leave can be got from the court, often called on that account the king's or queen's keys, to enable the messenger to break open the outer door and arrest. In England, though it is not competent for the bailiff to break open the outer door by force, yet every trick or stratagem is fair in order to effect a peaceable entry, and once in he cannot be turned out. Where the party is charged with a criminal offence a constable armed with a warrant, or in some cases without, is entitled to break into the house and arrest him, both in England and Scotland. A man is entitled also to defend his house against trespassers and thieves, using no greater force than is necessary; and if necessary in that sense, he may even kill the intruder, though very strong circumstances are required to justify this. He may also

put spring-guns on the premises: but by doing so he may render himself liable to an action if any person lawfully entering the premises should be injured. In Scotland a peculiar name is given to the offence of feloniously assaulting a man in his own house, called Hamesucken (q.v.), a name also used in the old law of England; and all offences committed in another person's house are generally punished more severely than those not committed in a house at all. See also EVICTION.

House-boat. See BARGE.

Housebote. See ESTOVER.

Housebreaking is the breaking and entering into a dwelling-house, shop, or warehouse, between the hours of 6 A.M. and 9 P.M., and stealing any chattel or money to any value. The drawing a latch, the opening a window, or the employment of fraudulent means to effect an entry constitutes *breaking and entering*. The punishment ranges from fourteen years' penal servitude to two years' imprisonment. See BURGLARY, where the law in the United States is also noticed.

Housebreaking. See ARSON.

House-fly (*Musca domestica*), perhaps the most familiar and widely distributed dipterous insect. Adults are to be seen the whole year round, though naturally most numerous in summer. They feed indiscriminatingly on whatever they can suck up through their fleshy proboscis or scrape off with their other mouth parts. The females lay their eggs in groups, about eight days after pairing, and the whole development occupies about a month. The eggs are deposited in decaying organic matter, in dung, or in any filth, and the larvæ are hatched in a day, or even less if the weather be warm. These larvæ are smooth, naked maggots, without legs or distinct head, with small hooklets at the mouth, and a length of about one-third of an inch. They feed on organic debris, move by contracting the abdomen, and grow for about a fortnight. Then they seek some dry resting-place, undergo pupation, and finally in another fortnight become winged insects.

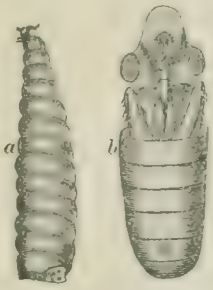


Fig. 1.

a, larva of house-fly, with breathing-pores at tail (greatly enlarged); *b*, young fly emerging from pupa-sheath.

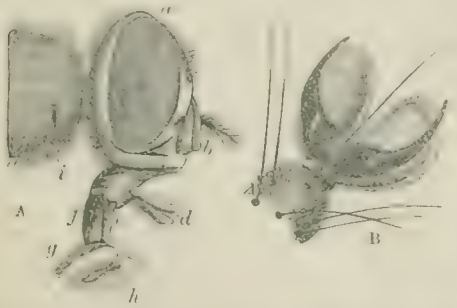


Fig. 2.

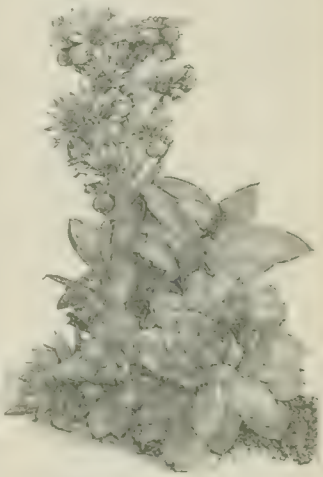
A, head of house-fly: *a*, compound eye; *b*, antennæ; *d*, maxillary palps; *e*, *f*, 'proboscis;' *g*, labellæ, lips of 'proboscis;' *h*, opening into 'proboscis;' *i*, thorax, with breathing-pore (after Von Hayek). B, end of a fly's foot, highly magnified, showing long hairs, two terminal claws, and two membranous adhesive pads.

Many parts of the house-fly, such as the sucking proboscis, or the hair-covered discs of the feet by which the insects adhere to the window-pane, well deserve the attention they generally get from those who use the microscope. Though house-flies do not bite, they are often extremely troublesome. Expedients for killing them off require no advertisement. It is more important to notice that house-flies are probably sometimes responsible for disseminating disease-germs.

Household. THE KING'S OR QUEEN'S, in Great Britain comprises the departments of the Lord Steward (q.v.), the Lord Chamberlain (q.v.), with the Lords of the Bedchamber, a medical department, the Royal Almonry, and the department of the Mistress of the Robes, which comprises the Ladies of the Bedchamber, the Bedchamber Women, and the Maids of Honour. For the Lords and Ladies of the Bedchamber, see BEDCHAMBER (see also ROYAL FAMILY). The *Maids of Honour*, of whom there are eight, are immediate attendants on the royal person, and in rotation perform the duty of accompanying the Queen on all occasions. They enjoy by courtesy the title 'Honourable,' when not entitled to it by birth, and are then designated the 'Honourable Miss ——' without the Christian name.

Household Troops are those troops whose especial duty it is to attend the sovereign and to guard the metropolis. These forces comprise three regiments of cavalry—the 1st and 2d Life Guards and the Royal Horse Guards; and three regiments of foot—the Grenadier Guards of three battalions, and the Coldstream and Scots Guards of two battalions each. See GUARDS.

House-leek (*Sempervivum*), a genus of plants of the natural order Crassulaceæ, having a calyx of six to twenty sepals, the petals equal in number to the sepals, and inserted into the base of the calyx; the leaves generally very succulent, and forming close rosettes. The Common House-leek or Cyphel (*S. tectorum*), called *Fous* or *Fouds* in Scotland, and in some countries *Jupiter's Beard*, grows wild on the rocks of the Alps, but has long been common in almost every part of Europe, planted on walls, roofs of cottages, &c. It sends up leafy flowering stems of 6 to 12 inches in height, bearing branches of pale red star-like flowers, equally curious and beautiful. The leaves cut or bruised and applied to burns afford immediate relief, as they do also to stings by bees or wasps; and they are beneficial when applied to ulcers and inflamed sores. They were formerly in high esteem as a remedy for fevers and other diseases; and an edict of Charlemagne contributed greatly to the extensive distribution of the plant. The edict is in these words: *Et habeat quisque super domum suam Jovis barbam* ('And let everybody have the



Common House-leek (*Sempervivum tectorum*).

Jupiter's beard on his house'. Other species possess similar properties. *S. sobolifera*, with yellowish green flowers, is very frequently planted on walls in Germany. The fishermen of Madeira say that nets rubbed with the fresh leaves of *S. glaucum* are thereby rendered as durable as if tanned, provided they are also steeped in some alkaline liquor. Some of the species, natives of the south of Europe, Canary Isles, &c., are shrubby; others are common greenhouse plants.

Housemaid's Knee is the term commonly applied to an acute or chronic inflammation of the bursa or sac that intervenes between the patella, or knee-pan, and the skin. Housemaids are especially liable to it from their kneeling on hard damp stones. In its acute form it causes considerable pain, swelling, and febrile disturbance. The only disease for which it can be mistaken is inflammation of the synovial membrane lining the cavity of the joint; but in this disease the patella is thrown forwards and the swelling is at the sides, while in housemaid's knee the swelling is very superficial, and is in front of the patella. The treatment in the acute form consists essentially in the means usually employed to combat inflammation—viz. rest, leeches, fomentations, and purgatives; if suppuration take place the sac must be freely opened and the pus evacuated. The chronic form may subside under rest, blisters, &c., or it may require incision or excision for its cure.

House of Lords, Commons. See PARLIAMENT.

House-rents. See LANDLORD AND TENANT.

Housing of the Poor. A Royal Commission to inquire into the condition of the working-classes sat in 1884 and 1885. Acts for facilitating improvement in the dwellings of the working-classes have been passed in 1868, 1875, and 1879. See GUINNESS, HILL, PEABODY; as also COTTAGE, LABOURERS, LODGING-HOUSE, POOR.

Houssa. See HAUSSA.

Houston, capital of Harris county, Texas, on the navigable Buffalo Bayou, 49 miles by rail NW. of Galveston, with which it is connected also by steamboats. It is the great railway centre of the state, stands in the midst of a fertile country, and ships large quantities of cotton, grain, and cattle, besides the products of the great pine-forests, which are prepared here. The other manufactures include machinery, iron-castings, railway carriages, farming implements, fertilisers, cotton-seed oil, &c. Pop. (1870) 9382; (1880) 18,646; (1890) 27,557.

Houston, SAMUEL, president of Texas, was born in Rockbridge county, Virginia, March 2, 1793, was brought up near the Cherokee territory in Tennessee, and was adopted by one of the Indians there. In 1813 he enlisted as a private soldier, and by persistent bravery rose to the rank of second-lieutenant before the end of the war. He left the army in 1818, studied law at Nashville, and was elected in 1823 and 1825 a member of congress, and in 1827 governor of Tennessee. In January 1829 he married the daughter of an ex-governor; but in the following April, for reasons never made public, he abandoned wife, country, and civilisation, and spent three years among the Cherokees, beyond the Mississippi, where his adoptive father had settled. In 1832 Houston went to Washington, and procured the removal of several United States Indian agents on charges of fraud, but got into personal difficulties with their friends. The Texan war offered a new field to his ambition. He was made commander-in-chief. The Americans at first sustained some severe losses, but on 21st April 1836 Houston with 750 men inflicted a crushing defeat on a force of 1800 Mexicans under Santa-Anna, on the banks of the San Jacinto, and by this one decisive blow achieved the independence of Texas. The hero of San Jacinto was elected first president of the republic, and re-elected in 1841, and on the annexation of Texas, in 1845, was elected to the United States senate. Elected governor of Texas in 1859, he opposed secession, was deposed in March 1861, and took no further part in public affairs. He died 26th July 1863.

Hovas. See MADAGASCAR.

Hovedon, ROGER OF, an old English chronicler, most probably born at Howden, in Yorkshire, who was attached to the household of Henry II., and was employed in missions to the lords of Galloway and to the heads of the monastic houses. In 1189 he was appointed an itinerant justice for the forests in the northern counties, and he seems to have spent his last years in Yorkshire, probably at Howden. It may be supposed that he did not survive 1201, as his *Chronica* ends with that year. It commences with the close of the Chronicle of Bede in 732, and is divided by Bishop Stubbs into four parts: the *first*, ending with 1148, consisting chiefly of the *Historia post Bedam;* the *second*, ending with 1169, mainly based on the *Melrose Chronicle;* the *third*, ending with 1192, mainly an abridgment of Benedict's *Chronicle;* and the *fourth*, ending with 1201, a record of contemporary events, not without value. The *Chronicle* was first printed in Sir H. Saville's *Scriptores post Bedam* in 1596. There is an English translation by H. F. Riley in Bohn's 'Antiquarian Library' (2 vols. 1853). The original forms 4 volumes (1868–71) in the Rolls series, under the editorship of Bishop Stubbs.

Hovellers. See DEAL.

Hoven. See HOOVE.

Howard. The noble House of Howard has stood for many centuries at the head of the English nobility. The Howards have enjoyed the dukedom of Norfolk since the middle of the 15th century, and have contributed to the annals of the nation several persons of the most distinguished character both in politics and in literature. Neither Sir W. Dugdale nor Collins claims for the Howards any more ancient origin than Sir William Howard, a learned Chief-justice of the Common Pleas under Edward I. and Edward II., though Dugdale incidentally mentions a tradition that their name is of Saxon origin, and derived either from an eminent office under the crown before the Conquest, or from Hereward, the leader of those forces which for a time defended the isle of Ely so valiantly against William the Conqueror. The pedigree earlier than Sir William Howard has been completely demolished in an article on 'Doubtful Norfolk Pedigrees' printed in the *Genealogist*. Be this as it may, it is certain that Sir John Howard, the grandson of the above-mentioned judge, was not only admiral and captain of the king's navy in the north of England, but sheriff of Norfolk, in which county he held extensive property, which was subsequently increased by the marriage of his grandson, Sir Robert, with the co-heiress of the ancient and noble House of Mowbray, Dukes of Norfolk. The only son of this union was Sir John Howard, one of the leading supporters of the House of York, who, having gained early distinction in the French wars of Henry VI., was constituted by Edward IV. constable of the important castle of Norwich, and sheriff of Norfolk and Suffolk. He subsequently became treasurer of the royal household, obtained 'a grant of the whole benefit that should accrue to the king by coinage of money in the City and Tower of London, and elsewhere in England;' and further, was raised to the peerage as Lord Howard and Duke of Norfolk. We find him in 1470 made captain-general of the king's forces at sea, and he was

most strenuous in that capacity in his resistance to the House of Lancaster. Finally he was created Earl Marshal of England, an honorary distinction still borne by his descendants, and in 1484 was constituted Lord Admiral of England, Ireland, and Aquitaine. He fell next year, however, on Bosworth Field, and after his death his honours were attainted, as also were those of his son Thomas, who had been created Earl of Surrey. The latter, however, after suffering three years of imprisonment in the Tower of London, obtained a reversal of his own and his father's attainders, and, being restored to his honours accordingly, became distinguished as a general, and is more particularly celebrated in history for his defeat of the Scotch at Flodden in 1513. His son Thomas, third Duke of Norfolk, was attainted by Henry VIII., but was afterwards restored in blood, and by his marriage with a daughter of King Edward IV. became the father of the ill-fated and accomplished Earl of Surrey (q.v.), whose execution was the last of the many acts of tyranny which disgrace the memory of Henry VIII. The same sentence had been passed on the duke, when the death of the royal tyrant saved him from the block. His grandson Thomas, fourth Duke of Norfolk, in like manner suffered attainder, and was executed on Tower Hill for high-treason, for his communication with Mary, Queen of Scots. The family honours, however, were again restored, partly by James I. to his grandson, and partly by Charles II. to his great-great-grandson, Thomas, who thus became eighth duke, and whose cousin and successor, Charles, ninth duke, was the direct ancestor of the present Duke of Norfolk.

It would be impossible here to give a list of all the honours which from time to time have been conferred on various branches of the ducal House of Howard; it is sufficient to say that, in one or other of their widespread branches, the Howards either have enjoyed within the last three centuries, or still enjoy, the earldoms of Carlisle, Suffolk, Berkshire, Northampton, Arundel, Wicklow, Norwich, and Effingham, and the baronies of Bindon, Howard de Walden, Howard of Castle Rising, and Howard of Effingham.

It will be seen from the above remarks that the ducal House of Norfolk is one whose fate it has been, beyond all others among the English nobility, to find its name interwoven with the thread of English history, and not rarely in colours of blood. The accomplished but unfortunate Surrey, and his scarcely less unhappy father, Thomas Howard whose head was only saved from the block on which his son so nobly suffered by the death of the eighth Henry—are 'household words' in the pages of English history; and readers of Shakespeare will have other recollections of the same name allied with other historical events; while those who are familiar with the writings of Pope will not have forgotten how tersely and pointedly he typifies the glory of ancestral pedigrees by 'All the blood of all the Howards.' Other members of the House of Howard have gained a place in the pages of English history. Sir Edward Howard, K.G., brother of the first Earl of Surrey, was made by Henry VIII. the king's standard-bearer and admiral of the fleet, in which capacity he lost his life in boarding a French vessel off Brest in action in 1513; his brother, Sir Edmund, acted as marshal of the horse at Flodden; and his half-brother, Sir Thomas Howard, was attainted, and died a prisoner in the Tower, for aspiring to the hand of the Lady Margaret Douglas, daughter of Margaret, Queen of Scotland, and niece of Henry VIII., one of whose ill-fated consorts was the Lady Catharine Howard.

Howard, CATHARINE, fifth queen of Henry VIII., was a granddaughter of the second Duke of Norfolk. The year of her birth, not known with certainty, was probably 1521 or 1522. Catharine was brought up partly in her father's house, partly in that of her grandmother, the Duchess of Norfolk. In 1540 the king married Anne of Cleves. But it was a marriage for which he had no liking; and Gardiner, the Roman Catholic Bishop of Winchester, being just then recalled to favour, he and his party endeavoured to bring the king and Catharine together. Anne of Cleves was divorced on the 9th of July, and Henry married Catharine Howard on the 28th of the same month. But in November the queen was accused to Henry of having been guilty of immoral conduct with two gentlemen of her grandmother's household, but previous to her marriage with the king. The evidence against her was convincing, and on this charge she was beheaded on 13th February 1542.

Howard, JOHN, the philanthropist and prison reformer, was born at Hackney, in Middlesex, on 2d September 1726, though both place and date are given differently by different authorities. His education was mostly got through private tuition. The inheritance of an ample fortune, which fell to him on the death of his father in 1742, enabled him to gratify his taste for continental travel. In 1756, after his wife's death, he set sail for Lisbon, which had just been devastated by the great earthquake, but was captured on the way by a French privateer, and carried to Brest, where he was thrown into prison. There even a short captivity sufficed to leave upon his mind a lasting impression of the inhuman treatment to which prisoners of war were subjected in French prisons. After his return home Howard married a second time, and settled at Cardington, 3 miles from Bedford. That village reaped the first-fruits of those philanthropic exertions which afterwards culminated in such noble labour, the work of prison reform. In 1773 Howard was nominated high-sheriff for the county of Bedford, and his interest in prisons and their inmates was now first fairly roused to the pitch of practical effort. He was struck with the injustice under which many poor prisoners suffered, in that they were detained in prison untried, or even after being pronounced innocent, until they or their friends had paid certain fees to the gaolers and other officials. Howard at once began a long series of tours throughout Great Britain and Ireland, for the purpose of investigating the condition of prisons, and inquiring into the management and treatment of prisoners. Chiefly as the result of his efforts, two acts were passed in 1774, one making provision for fixed salaries to be paid to the gaolers, and the other enforcing greater cleanliness in prisons, with a view to the prevention of the dreaded gaol-fever. From this time onward Howard prosecuted with unwearied zeal and patience this the great work of his lifetime, upheld by an indomitable sense of duty, and supported by a devout faith and his own firm, steadfast will. The remaining years of his life were principally spent in visiting the prisons of Great Britain and the countries of the Continent. Amongst the graver abuses he set himself to get abolished in his native land were such things as these: many prisons were in a deplorably dilapidated state, the cells narrow, filthy, and unhealthy; debtors and felons were confined promiscuously in the same prisons; separate apartments were not provided for the two sexes, and the gaolers were allowed to sell liquors to those placed under their charge, causes directly ministering to immorality and drunkenness. Howard's endeavours to relieve human suffering in prisons easily turned his thoughts to hospitals; and he also directed his efforts to the alleviation of suffering and the removal of abuses in these establishments, as well as in schools and all kinds of benevolent institutions. From 1785 he devoted his attention

more especially to the plague, and to the consideration of means for its prevention. With this end in view, he studied it in the hospitals and lazarettos of the chief Mediterranean towns in which it was wont to show itself. But whilst still pursuing his investigations, he was himself struck down by typhus fever at Kherson, in Russia, and died on 20th January 1790. He was buried at Dophinovka (now Stepanovka), 4 miles N. of Kherson. The chief results of his extensive observations were recorded with faithful accuracy and great minuteness of detail, though with little sense of generalisation, in two works—*The State of Prisons in England and Wales, with an Account of some Foreign Prisons* (1777), to which a supplement was added in 1780, whilst the editions of 1784 and 1792 were each an enlargement on its predecessor; and *An Account of the Principal Lazarettos in Europe* (1780). In consequence of his noble self-denying labours Howard has become the proverbial ideal of a philanthropist, the type of the best kind of humanitarian activity and love. Burke, in speaking of his labours at Bath in 1781, said, 'He has visited all Europe, not to survey the sumptuousness of palaces or the stateliness of temples; not to make accurate measurements of the remains of ancient grandeur, nor to form a scale of the curiosity of modern art; nor to collect medals or collect manuscripts; but to dive in the depths of dungeons, to plunge into the infection of hospitals, to survey the mansions of sorrow and pain, to take the gauge and dimensions of misery, depression, and contempt, to remember the forgotten, to attend to the neglected, to visit the forsaken, and to compare and collate the distresses of all men in all countries. . . . It was a voyage of discovery, a circumnavigation of charity.' See Lives by Baldwin Brown (1818), Taylor (1836), Hepworth Dixon (1849), Field (1850), and Stoughton (1853; new ed. 1884); *Correspondence of Howard* (1855) by J. Field; and the article PRISONS.

Howard, OLIVER OTIS, an American general, was born at Leeds, Maine, 8th November 1830, graduated at West Point in 1854, took command of a regiment of Maine volunteers in 1861, and was made brigadier-general for gallantry at the first battle of Bull Run. He lost an arm at Fair Oaks in 1862, but afterwards was in several actions, and in 1864 commanded the Army of the Tennessee in the invasion of Georgia. He commanded the right wing of Sherman's army in the march to the sea and through the Carolinas. He was commissioner of the Freedmen's Bureau from 1865 until its abolition in 1874, and was the first president of Howard University (see WASHINGTON, D.C.), which was named in his honour. He conducted two Indian campaigns, in 1877 and 1878; in 1886 he was promoted to major-general, and received the command of the division of the Pacific; in 1889 he was transferred to that of the Atlantic. General Howard is a chevalier of the Legion of Honour (1884). He has published several books, including *Chief Joseph* (1881), an account of his campaign against the Nez Perces.

Howard of Effingham, CHARLES, LORD, was born in 1536, and in 1573 succeeded his father, who was the ninth son of the second Duke of Norfolk, and who in 1554 had been raised to the peerage and been made Lord High Admiral. In 1585 that dignity was conferred on the son, and as such in 1588 he commanded gloriously against the Armada (q.v.). For his share with Essex in the Cadiz expedition (1596) he was created Earl of Nottingham, and in 1601 he put down Essex's mad insurrection. In 1619 he resigned his office in favour of Buckingham; and he died 14th December 1624. Contrary to the common opinion, there is no proof that he was ever a Catholic (*Notes and Queries*, 1851, 1888).

Howe, ELIAS (1819–67), inventor of the Sewing-machine (q.v.).

Howe, JOHN, the most philosophic of the Puritan divines, was born 17th May 1630, at Loughborough, in Leicestershire, to the living of which parish his father had been presented by Laud. He studied both at Oxford and Cambridge, where he made the friendship of the most distinguished professors and students of that day. After preaching for some time at Winwick, in Lancashire, and Great Torrington, in Devonshire, with much acceptance, he was appointed domestic chaplain to Cromwell in 1656, a position he occupied with great reluctance, but in which he discharged his difficult duties with rare firmness and courtesy, not fearing to speak his mind before Cromwell himself, and winning praise even from the enemies of his party. Indeed, throughout life he was on the most intimate terms with persons so wide apart as Baxter and other nonconformist divines, and the most distinguished ornaments of the Establishment, as Stillingfleet and Tillotson. At the Restoration he returned to Torrington, where he remained for about two years. But the Act of Uniformity ejected him from his parish, 24th August 1662; for though one of the most liberal-minded of the Puritans, and not troubled with morbid conscientiousness, he was also a man of strong principle. Like many others of the nonconformist ministers, he wandered about preaching in secret till 1671. In 1668 he published his first work, *The Blessedness of the Righteous*, which was very popular. In 1671 he was invited by Lord Massereene, of Antrim Castle, in Ireland, to become his domestic chaplain, where he spent four years of great happiness, preaching every Sabbath at Antrim church, with the sanction of the bishop. Here he wrote his *Vanity of Man as Mortal*, and began his greatest work, *The Good Man the Living Temple of God* (1676–1702), which occupies one of the highest places in Puritan theology. In 1675 he was called to be pastor of the dissenting congregation in Silver Street, London, and went thither in the beginning of 1676. In 1677 he published, at the request of Mr Boyle, *The Reconcileableness of God's Prescience of the Sins of Men with the Wisdom of His Counsels, and Exhortations;* in 1681, *Thoughtfulness for the Morrow;* in 1682, *Self-dedication;* in 1683, *Union among Protestants;* and in 1684, *The Redeemer's Tears wept over Lost Souls.* In 1685 he was invited by Lord Wharton to travel with him on the Continent; and after visiting the principal cities, he resolved, owing to the state of England, to settle for a time at Utrecht, where he was admitted to several interviews with the Prince of Orange. In 1687 the Declaration for Liberty of Conscience induced him to return to England, and at the Revolution next year he headed the deputation of dissenting clergymen when they brought their address to the throne. Besides smaller works, he published, in 1693, *Carnality of Religious Contention;* in 1694–95, several treatises on the Trinity; in 1699, *The Redeemer's Dominion over the Invisible World;* and he continued writing till 1705, when he published a characteristic work, *Patience in Expectation of Future Blessedness.* He died 2d April 1705.

Howe was a man of a noble presence, with a finely-balanced mind, a profound thinker, yet gifted with great practical sagacity. His own convictions were very decided, yet he had large toleration for the opinions of others, and of one of his persecutors writes 'he did not doubt after all to meet him one day in that place where Luther and Zwinglius well agreed.' The value of his writings is greatly marred by a poor style and innumerable subdivisions and

digressions, which led a woman once to say 'he was so long laying the cloth that she always despaired of the dinner.' But Robert Hall said of him, 'I have derived more benefit from the works of Howe than from those of all other divines put together.' A great admirer of Plato, 'though without the slightest pretension to the eloquence of the renowned Grecian, he bore no mean resemblance to him in loftiness of mind, sublimity of conception, and, above all, in intense admiration of all moral excellence.' 'Of the consummate ability with which he must have conducted himself no other proof is needed than the statement of the following facts: that he was often employed in the most delicate affairs by Cromwell, yet without incurring either blame or suspicion; without betraying confidence or compromising principle; that, though exposed to scrutinising eyes, he left not a rivet of his armour open to the shafts either of malice or envy, and that he could awe Cromwell into silence and move Tillotson to tears; that he never made an enemy and never lost a friend.' His works were published in 1724, 2 vols. folio, with a life by Dr Calamy; more than one edition has been published since. See H. Rogers' *Life of John Howe* (1836), and the short monograph by R. F. Horton (1896).

Howe, RICHARD HOWE, EARL, admiral, son of Viscount Howe of the Irish peerage, was born in London, 8th March 1726. He left Eton at thirteen, and, entering the navy, served under Anson (q.v.) against the Spaniards in the Pacific. Made post-captain at twenty, he in that same year drove away from the coast of Scotland two French ships conveying troops and ammunition to the young Pretender. After serving off the coast of Africa, Howe took an active part in the naval operations of the British during the Seven Years' War, especially distinguishing himself by the capture of the island of Chaussey, in the attacks upon the isle of Aix, St Malo, and Cherbourg, and in engagements with the French fleet in 1755 and 1759. In 1758 he succeeded to the Irish title of viscount on the death of his brother, George Augustus (1724–58), the brigadier-general, who was killed before Ticonderoga. Appointed a Lord of the Admiralty in 1763, he was promoted two years later to the important office of Treasurer of the Navy. In 1778 he defended the American coast against a superior naval force under D'Estaing, whom he repelled off Rhode Island. He was made a viscount of Great Britain in 1782. Being sent out the same year to relieve Gibraltar, he disembarked troops, ammunition, and supplies, and then offered battle to the combined fleets of France and Spain, but they, declining an engagement, drew off towards Cadiz. Howe was made First Lord of the Admiralty in 1783, and received an English earldom in 1788. When war with France broke out in 1793 he took command of the Channel fleet, and next year gained off Ushant the victory which is known as that of 'the glorious first of June.' The French fleet consisted of twenty-six ships of the line, and the British of twenty-five. In a very short time the latter captured seven of the enemy's vessels and dismasted ten more. Howe's last public service was to bring back to their duty the mutinous seamen at Spithead and Portsmouth in 1797. He died August 5, 1799, leaving the reputation of being a thorough seaman, cautious, cool and intrepid in danger, and considerate of his men. He greatly increased the efficiency of the navy by the introduction of a new system of evolutions and naval tactics. See Lives by G. Mason (1803) and Sir J. Barrow (1838).—Another brother, WILLIAM (1729–1814), held a command under Wolfe at Quebec, succeeded General Gage in 1775 as commander-in-chief of the British forces in America, commanded at Bunker Hill, took New York, defeating Washington at White Plains and at Brandywine, but was superseded by Sir Henry Clinton in 1778, for having lost the opportunity of destroying the American force at Valley Forge. He subsequently held various honorary commands in Britain, and succeeded to his brother's viscounty in 1799.

Howe, SAMUEL GRIDLEY, M.D., an American philanthropist, was born in Boston, November 10, 1801, and graduated at Brown University in 1821, and at the Harvard medical school in 1824. He served as a surgeon during the Greek war of independence from 1824 to 1827, organising the medical staff of the Greek army. He then went to America to raise contributions, and, returning with food, clothing, and supplies, formed a colony on the isthmus of Corinth. Swamp-fever, however, drove him from the country in 1830. In 1831 he went to Paris to study the methods of educating the blind, and, having become mixed up in the Polish insurrection, spent six weeks in a Prussian prison. On his return to Boston he established a school for the blind, his most famous pupil being Laura Bridgman (q.v.). He also established a school for the training of idiots. In 1851-53, assisted by his wife, he edited the anti-slavery *Commonwealth*, and, after revisiting Greece in 1867 with supplies for the Cretans, he edited in Boston *The Cretan*. He died 9th January 1876.—His wife, JULIA WARD HOWE, born in New York city, 27th May 1819, became prominent in the woman-suffrage movement since 1869, preached in American Unitarian pulpits, and published, besides narratives of travel and a Life of Margaret Fuller, several volumes of poems, *Passion Flowers* (1854), *Words for the Hour* (1857), and *Later Lyrics* (1866), the last the best. In 1861 she wrote the 'Battle-hymn of the Republic.'

Howell, JAMES, whose *Familiar Letters* is still an English classic, was born in July 1593, son of the minister of Abernant, in Carmarthenshire, studied at Hereford and Jesus College, Oxford, and took his B.A. in 1613. He then became steward to a glass-ware manufactory, and traversed in its interests Holland, Flanders, Spain, France, and Italy. He was next employed abroad on public business in 1626, became secretary to Lord Scrope at York, was returned to parliament for Richmond in 1627. From 1632 to 1642 he was mainly employed as a royalist spy; and in 1642 (when he was appointed an extra clerk to the Privy-council) he was sent by the parliament to the Fleet, where he lay till 1650. At the Restoration the office of historiographer-royal was created for him. He died in 1666, and was buried in the Temple church. Howell was a man of considerable humour, learning, and industry. Besides translations from Italian, French, and Spanish, he wrote no less than forty-one original works on history, politics, and philological matters. He had put his travels to much profit. 'Thank God,' he says, 'I have this fruit of my foreign travels, that I can pray unto him every day of the week in a separate language, and upon Sunday in seven.' His *Instructions for Forreine Travell* (1642) is still interesting, and is reprinted in Professor Arber's series (1869); and his supplement to Cotgrave's French and English dictionary maintains its interest for lexicographers; but it is by his *Epistolæ Ho-Elianæ: or Familiar Letters, Domestic and Forreign* (1645–55; 10th ed. 1737), that his name continues to be remembered. These display not only shrewd sense and brilliant wit, but also grace and form, and indeed are the earliest letters in our language that are really literary.

Dr Jacobs, the modern editor of Howell's *Letters*, says of him at length in a preface dated by Mr Joseph Jacobs in 1892.

Howell's State Trials, the name given to the [illegible] edited by Cobbett, in 1809,

because vols. xi. to xxi. of this work were edited by Thos. Bayly Howell (1768–1815), and vols. xxii. to xxxiii. by his son, Thos. Jones Howell (died 1858).

Howells, William Dean, a popular American novelist, was born at Martin's Ferry, Ohio, 1st March 1837. His father's family was of Welsh Quaker origin, and he himself was brought up a Swedenborgian. From an early age he was familiar with press work, as his father was a busy and not always prosperous printer and journalist; but his earliest serious work in journalism was in the Cincinnati *Gazette* and Columbus *State Journal*. A life of Lincoln, written in 1860, procured him the post of consul at Venice, which he held from 1861 to 1865, making himself master of Italian the while, and writing his able papers, collected in *Venetian Life* (1866). After his return to America he wrote for the New York *Tribune* and the *Times*, the *Nation*, and the *Atlantic Monthly*, and filled the editor's chair of the last from 1872 till his retirement in 1881. His later work in periodicals was done for the *Century* and *Harper's Magazine*. He had already made his mark as a first-rate journalist, a fair poet, and a clever critic, when in 1871 he found his real work as a writer of fiction. His clever story, *Their Wedding Journey*, at once brought him popularity which quickly grew in England no less than America, as the growing merit of succeeding novels made it more and more deserved. Of these the best are *A Chance Acquaintance* (1873), *A Foregone Conclusion* (1874), *A Counterfeit Presentment* (1877), *The Lady of the Aroostook* (1878), *The Undiscovered Country* (1880), *Doctor Breen's Practice* (1883), *A Modern Instance* (1883), *A Woman's Reason* (1884), *The Rise of Silas Lapham* (1885), *An Indian Summer* (1886), *Annie Kilburn* (1888), *A Hazard of New Fortunes* (1889), and *The World of Chance* (1893).

These works reveal their author to us as an artist of great conscientiousness and industry, but of decided shortcomings as well as gifts. He is humorous, brilliant, epigrammatic, and acute, but he cannot tell a story, and his ambitious analysis of commonplace characters is overdone to the extent of tediousness. With all his gifts he is not a great artist in fiction, and he lacks that rare combination of sympathy and humour which gave George Eliot and Mrs Gaskell their insight into what was really generic and human at the heart of the trivialities of everyday life. Howells wastes his strength on the over-elaboration of details, but too often these are not the really significant, and thus the general effect of the whole portrait is feeble, indistinct, and unsatisfactory. His over-elaborated rather than really refined Bostonians, and his Americans expanding spiritually under the new conditions of an ancient civilisation in some Italian city are always carefully painted and indeed striking portraits, but almost always they fall a little short of the one thing needful—that look of the life which is creation, and which evidently demands the intuition of genius to catch.

Howietoun. See Pisciculture.

Howitt, William and Mary, whose writings charmed, interested, and instructed the public during the earlier half of the 19th century, may best be treated together. William Howitt, the son of a land-surveyor of good descent, a member of the Society of Friends, was born at Heanor, Derbyshire, in 1792, and was educated at Ackworth and Tamworth. With no intention of pursuing the business, he served a four years' apprenticeship to a builder, carpenter, and cabinet-maker. Possessed of strong literary tastes, and fond of country life and sports, he wrote poems, and an account of a country excursion after the manner of Washington Irving. On April 16, 1821, William Howitt married Mary Botham, a young lady of kindred tastes (born at Uttoxeter, 12th March 1799), and they settled at Hanley, to conduct a chemist's business. After a few months they removed to Nottingham for twelve years of steady and successful literary industry and mental improvement. Their later places of abode were Esher, in Surrey, London, Heidelberg, and Rome. The record of their after-life is a record of the books they wrote, of pleasant travel for literary purposes, while they were on terms of easy intercourse with all their notable contemporaries. In 1852–54, at the height of the gold-fever, William Howitt was in Australia. The Howitts were instrumental in getting £1000 for Miss Meteyard's life of Wedgwood, and it was at William Howitt's suggestion that Mrs Gaskell wrote her first novel. They quitted the Society of Friends in 1847; William Howitt became a believer in spiritualism, and in May 1882 Mary Howitt joined the Catholic communion. After a long life of blameless literary industry William Howitt died at Rome, March 3, 1879. Mary Howitt, whose heart and mind 'ever flowed with love and interest for all her surroundings,' composed and wrote from her earliest years, and most people have seen or read some of her poems, ballads, novels, or juvenile tales, of which she wrote many. By means of translations she first made the works of F. Bremer and Hans Andersen known to the English public. She wrote for the annuals, for the *People's Journal*, *Howitt's Journal*, *Chambers's Journal*, &c. A pension was bestowed upon her in 1879 by Lord Beaconsfield. She died at Rome, January 30, 1888, and her remains were laid beside those of her husband in the cemetery of Monte Testaccio. One critic has justly said that W. Howitt and his wife are inseparably associated with all that is enchanting in rural England. In their poems, their novels, and the stories of their country rambles they made themselves the exponents of nature, blending the idealism of poetic fancies with pictures that have the realism of photographs. In politics William Howitt was an extreme Radical. Joint productions of William and Mary Howitt were the *Forest Minstrel* (1827), *Desolation of Eyam* (1827), *Book of the Seasons* (1831), *Literature and Romances of Northern Europe* (1852), *Stories of English Life* (1853), and *Ruined Abbeys of Great Britain*. William Howitt's chief works, besides contributions to newspapers and magazines, were *History of Priestcraft* (1833); *Pantika* (1835); *Rural Life in England* (1837); *Visits to Remarkable Places* (1838; second series, 1841); *Colonisation and Christianity* (1838); *Boy's Country Book* (1839); *Student Life of Germany* (1841); *Homes and Haunts of the Poets* (1847); *Land, Labour, and Gold* (1855); *Illustrated History of England* (6 vols. 1856–61); *History of the Supernatural* (1863); *Discovery in Australia, Tasmania, and New Zealand* (1865); *Mad War Plant, and other Poems* (1871). See *Mary Howitt, an Autobiography*, edited by her daughter, Margaret Howitt (2 vols. 1889).

Howitzers (Ger. *Haubitzen*) are guns which came into use early in the history of field artillery, as portable instruments for discharging shell into a hostile force. As for this purpose no great range was necessary, a small charge of powder sufficed; and the howitzer could be made, in proportion to its large bore, extremely light. For modern howitzers, see Cannon.

Howler, Howling Monkey, or Stentor (*Mycetes*), a genus of Central and South American monkeys, remarkable for the dilatation of the hyoid bone into a hollow drum, which communicates with the larynx, makes a conspicu-

ous external swelling of the throat, and gives prodigious power to the voice, enabling these animals to emit hideous sounds, which can be heard at least two miles away, and to which all their names refer. They live chiefly among the branches of trees, and take extraordinary leaps from one to another, taking hold by the tail like most of the American Platyrrhine monkeys, as readily as by the hands, and often swinging by it alone. They are gregarious, and unite their voices in concert, so as to produce a most deafening noise; this is what Humboldt and others say, but according to Wallace it is only one individual at a time which causes all the sound. The monkeys of this genus have a low intelligence, and their brain structure bears out this view. A howler was first brought alive to Europe and exhibited at the Zoological Gardens, London, in 1863. There are apparently not more than six species.

Howrah, or HAURA, a town of India, with growing manufactures, on the right or west bank of the Hooghly, directly opposite to Calcutta, of which it is practically a suburb. It is connected with Calcutta by a floating bridge (1874), and is the Bengal terminus of the East Indian Railway. Pop. (1872) 97,784; (1881) 105,628; (1891) 129,800.

Howson, JOHN SAUL, dean of Chester, was born in 1816, and in 1837 took a double first-class at Cambridge. Taking orders eight years later, in 1849 he became principal of the Liverpool College, and in 1867 dean of Chester. The complete restoration of the cathedral was in great measure due to his energy and devotion. He died 15th December 1885. With Conybeare he wrote the well-known *Life and Epistles of St Paul* (1852).

Howth, a peninsula on the east coast of Ireland, forming the north side of the Bay of Dublin, terminates in a lofty cliff, at the foot of which nestles the village of Howth, the chief fishing-station on that part of the coast.

Hoxton, a district of London, partly in Hackney, but mainly in Shoreditch; the Hoxton division being part of the parliamentary borough of Shoreditch.

Hoy (Scand. *Hoey*, 'high island'), one of the Orkneys, 1¼ mile SW. of Mainland or Pomona. It is 13¾ miles long, 3 furlongs to 6¼ miles broad, and 53 sq. m. in area. Unlike the rest of the group, Hoy rises abruptly from the sea, with stupendous cliffs that attain 1140 feet in Bracbrough or St John's Head, and 595 in Bervy Hill; inland are Cuilags Hill (1420 feet) and the Ward Hill (1564), commanding a splendid panoramic view. The rocks represent both the Upper and the Lower Old Red Sandstone. Near the south end is the fine natural harbour of Long Hope (5½ × 1⅔ miles). The 'Dwarfie Stone' is a sandstone block, 28 feet long, 14½ broad, 6½ high, with a chamber hollowed out of it; and the 'Old Man of Hoy' is an insulated pillar of rock, 450 feet high. Pop. (1841) 1486; (1891) 1320. See Tudor's *Orkneys* (1883).

Hoy, a small coasting vessel, differing little, if at all, from the sloop or smack, and often used for conveying goods from a large vessel to the shore.

Hoylake, a small watering-place of Cheshire, at the extremity of Wirral peninsula, 8 miles by rail W. of Birkenhead. It has a celebrated golf-links, opened in 1869. Pop. of district, 2519.

Hoyle, EDMOND, the creator of whist, was born in 1672, and is said to have been educated for the bar. Little is known about his life, except that he lived for some time in London, writing on games and giving lessons in whist, and died there on 29th August 1769. In 1742 he published his *Short Treatise on Whist*, containing the laws and some rules, for which he is said to have received £1000, and which in 1763 reached a 13th edition. See WHIST, and ten articles in *Notes and Queries* for 1889.

Hrabanus. See RABANUS MAURUS.

Hradschin. See PRAGUE.

Hualla'ga, a river of Peru, rises near the Cerro de Pasco, over 14,000 feet above the sea, flows north on the east side of the Central Cordillera, breaks through the range at the gorge of Chasuta, and enters the Marañon. Its total length is about 650 miles; it is navigable as far as Yurimaguas, above which are falls and rapids.

Huamanga. See AYACUCHO.

Huanaca, or GUANACO (*Lama huanacos*: see LLAMA), a species of the same genus with the llama, vicuña, and alpaca, of which some naturalists suppose it to be the wild original. It is found not only on the Andes, but throughout great part of Patagonia. It is of a reddish-brown colour, the ears and hind-legs gray. It generally lives in herds of ten to forty, and is very quick-sighted and wary; although such is the strength of its curiosity that hunters attract the herds within easy reach of their rifles by lying down on the ground and kicking their feet in the air. Like its congeners, the Huanaca is extremely sure-footed on rocky ground.

Huancaveli'ca, a department of Peru, lying entirely within the Cordilleras, with an area of 8710 sq. m. Pop. 104,155. The climate is cold and raw on the mountains, where sheep, cattle, and llamas are herded, and hot in the deep valleys, where sugar is grown. The chief riches are in the mines, especially of silver and quicksilver.—The capital, Huancavelica, 150 miles SE. of Lima, is a dreary mining town in the sierras; pop. 4000.

Huanchaca, seat of the chief silver mines in Bolivia (q.v.).

Huan'uco, a department of Peru, with an area of over 13,000 sq. m. Mining and agriculture are the chief industries. Pop. 78,856.—The capital, Huanuco, lies in a lovely valley on the Huallaga, amid plantations of coffee and sugar. It is a bishop's see. Pop. 5300.

Huber, FRANÇOIS, author of a book on the habits of bees, was born at Geneva, July 2, 1750, and died, 22d October 1830, at Pregny near his birthplace. At an early age he lost his eyesight, but with the assistance of his wife and an intelligent domestic he conducted a number of original and important observations on the habits of bees. His book first appeared as *Lettres à Ch. Bonnet* (1792); it was reprinted in 1796, and again in 1814, under the title of *Nouvelles Observations sur es Abeilles.* In his later years he derived important aid from his son, Jean Pierre (1777–1841), who wrote a valuable treatise on the *Habits of Ants* (1810).

Hubert, ST, Bishop of Liége, was son of Bertrand, Duke of Guienne, and was born in 656. He lived a luxurious and worldly life, first at the court of the Frankish king Theoderich, next under Pepin of Heristal, but after the death of his wife retired from the world into a monastery, on the advice of Bishop Lambert. Afterwards, when on a pilgrimage to Rome, he was made by Pope Sergius I. Bishop of Tongern, and in 708 succeeded his master, Lambert, in the see of Maestricht and Liége. He died in 727, and was afterwards canonised; his festival falls on November 3. He has been patron of orders of knighthood in Bavaria and Bohemia. See the books by Fétis (1846), Des Granges (1872), and Heggen (1875). In legend and in art, since the 15th century, St Hubert appears as a mighty hunter who was startled into repentance when hunting on Good Friday by the sudden appearance of a stag bearing between his horns a radiant crucifix.

At once he renounced hunting and all worldly pleasures, and became after his canonisation the patron saint of hunters. His aid is especially efficacious for persons bitten by mad dogs and those possessed with devils. See H. Gaidoz, *La Rage et St Hubert* (1887).

Hubertusburg, formerly a royal hunting-seat of Saxony, 25 miles E. by S. from Leipzig, built in 1721 by Prince Frederick Augustus, afterwards King Augustus III. of Poland. It was much injured during the Seven Years' War; and there on 15th February 1763 was signed the treaty by which that war was ended. Since 1840 the buildings have served as a prison, a hospital, an asylum for the insane, and a refuge for idiot children.

Hubli, a town of Dharwar in the presidency of Bombay, stands on a good road leading to Karwar on the Malabar coast, 102 miles to the south-west. It contains (1891) 52,595 inhabitants, and is one of the principal cotton-marts in that section of India.

Hübner, Rudolf Julius Benno, German painter, was born at Oels, in Silesia, 27th January 1806. He studied at Düsseldorf, to which school of painting he belongs. In 1841 he was appointed professor of Painting in the academy at Dresden, and was director of the picture-gallery from 1871 to 1882, in which year he died, 7th November, at Loschwitz, near Dresden. Among his pictures are 'Job and his Friends,' 'Charles V. in San Yuste,' 'Frederick the Great in Sansouci,' 'The Golden Age,' and 'The Dispute between Luther and Dr Eck.' He also designed glass paintings, including some for the crypt of Glasgow Cathedral.

Huc, Évariste Régis, French missionary and traveller, was born at Toulouse, August 1, 1813. Almost immediately after his ordination he joined in 1839 the missionary expedition of his order, the Lazarist Fathers, to China. In 1844 Huc, in company with Père Gabet and a single native convert, set out with the intention of penetrating to the unknown land of Tibet, beyond the terrible desert of Gobi. But it was not until January 1846 that they succeeded in reaching Lhassa, the capital of Tibet, and the residence of the Dalai Lama. And scarcely had they settled in that city and started a mission, when an order for their immediate expulsion from the country was obtained by the Chinese resident in Lhassa. They were conveyed back to Canton. Huc's health having completely broken down, he returned to France in 1852. His Asiatic experiences are recorded in *Souvenirs d'un Voyage dans la Tartarie, le Thibet, et la Chine pendant les Années 1844 46* (2 vols. Paris, 1850; Eng. trans. by W. Hazlitt, 1851–52), and *L'Empire Chinois* (2 vols. 1854; Eng. trans. 1855). He also wrote *Le Christianisme en Chine* (4 vols. 1857–58; Eng. trans. 1857–58). The strangeness of some of the incidents recorded in the book on Tibet provoked some degree of incredulity; but the testimony of later travellers in the same regions fully corroborates the truth of Huc's narrative. He died at Paris in March 1860.

Huckaback, a coarse kind of linen cloth, figured somewhat like damask, and usually employed for table-cloths and towelling.

Huckleberry. See Whortleberry.

Huddersfield, a 'clothing town' in the West Riding of Yorkshire, a municipal and county borough, 26 miles NE. of Manchester, 15 S. of Bradford, 17 SW. of Leeds, and 189 NNW. of London. Well built of stone and regular, it occupies a considerable extent of high ground, sloping down to the left bank of the Colne, which here receives the Holme; and it owes its rapid extension to its situation in a rich coal-district, to its abundant water-power, and to its transit facilities by rail and canal. Among the chief edifices are the circular cloth-hall (1768–80); the railway station (1848), with a marble statue of Peel (1875) before it; the classical town-hall (1880); the market-hall (1880); and the infirmary (1831–74). The Mechanics' Hall (1848) developed into the Technical School (1883). The first parish church of Huddersfield was built before 1110, rebuilt in Tudor times, and again (unhappily before the revival of architecture) in 1835. St John's (1853) was designed by Butterfield, and St Thomas' (1859) by Sir G. G. Scott. The Beaumont Park, 21 acres in area, was opened by the Duke of Albany in 1883, and there also is Greenhead Park of 26 acres. Huddersfield is the chief seat in the north of England of what is called the 'fancy trade,' and every description of plain woollen goods is also manufactured; whilst other industries are cotton and silk spinning, iron-founding, machine-making, &c. Roman remains have been found here; but Huddersfield has no history to speak of. In 1750 Bishop Pococke described it as 'a little town.' It was enfranchised by the Reform Act of 1832, and made a municipal borough in 1868, the boundary having been greatly extended the year before. Pop. (1861) 34,877; (1871) 74,358; (1881) 86,502; (1891) 95,422.

Hudson, a river in New York, and one of the most beautiful and important in America. It rises in the Adirondack Mountains, 4326 feet above the level of the sea, its head-streams the outlets of many mountain-lakes. At Glen's Falls it has a fall of 50 feet, and soon after, taking a southerly course, runs nearly in a straight line to its mouth, at New York city. It is tidal up to Troy, 151 miles from its mouth, and magnificent steamboats ply daily between New York and Albany. Below Newburg, 60 miles from New York, the river enters the highlands, which rise abruptly from the water to the height of 1600 feet. Here historical associations add to the interest of scenery of singular beauty and grandeur: here was the scene of Arnold's treason and of André's fate; and at West Point, the seat of the United States military academy, 8 miles below Newburg, are the ruins of Fort Putnam, built during the war of independence. Emerging from the highlands, the river widens into a broad expanse called Tappan Bay, which is 4½ miles wide and 13 long. Below, on the right bank, a steep wall of trap rock, called the Palisades, rises from the river's brink to a height of 300 to 510 feet, and extends for nearly 20 miles to the upper portion of the city of New York. The river from here is known as the North River, and is from 1 to 2 miles wide; and after passing between New York and Hoboken and Jersey City, it falls into New York Bay. Its whole length is about 350 miles, and its principal tributaries are the Sacondaga, Mohawk, and Walkill. The Hudson has valuable shad and sturgeon fisheries. The Hudson River Railway, connecting New York with Albany, runs along the east bank. The river, named from the English navigator who explored it in 1609, is connected by canals with Lakes Erie and Champlain, and with the Delaware River. In 1894 a suspension bridge connecting New York and Jersey City was sanctioned, and the plans approved in 1895. Robert Fulton's first successful experiment in steamboat navigation was made on this river in 1807. See 'Our River,' by John Burroughs, in *Scribner's Monthly* (August 1880); the *Panorama of the Hudson* (as far as Albany; New York, 1888); and Wallace Bruce, *The Hudson* (1895).

Hudson, capital of Columbia county, New York, stands on the left bank of the Hudson River, and on the Hudson River Railroad, 116 miles N. of New York city. It extends along a high ridge

ending in a bold promontory, at whose foot are the wharves; its former West Indian trade and its whale-fisheries have been abandoned, but it has still an active river-trade. Hudson has a fine court-house, a city hall, several foundries and blast-furnaces, and manufactures of fire-engines, paper, leather, flour, &c. Pop. 9970.

Hudson, GEORGE, the 'Railway King,' was born near York in March 1800. There he subsequently carried on business as a linen-draper. Inheriting a fortune of £30,000 in 1828, Hudson withdrew from business, and began to interest himself in local politics and in railway speculation. He became the ruling spirit of the York and North Midland Railway Company; and his ventures and schemes for amalgamating various railway companies were attended with extraordinary success. Hudson was elevated to the dictatorship of railway speculation. Everything he touched turned to gold. He bought large estates, was three times elected lord mayor of York, and was sent to parliament by the electors of Sunderland (1845). But the railway mania of 1847–48 plunged him into ruin. He was accused of having 'cooked' the accounts of companies with which he was connected, and of having paid dividends out of capital. Legal proceedings were instituted against him, and his suddenly-acquired gains were almost entirely swept away. The constituency of Sunderland, however, continued to elect him as their representative until March 1859. He afterwards lived in comparatively narrow circumstances, and died in London, December 14, 1871.

Hudson, HENRY, a distinguished navigator, of whom we know nothing before April 1607, when we find him starting, in a small vessel with ten sailors, on his first unfortunate voyage for the discovery of a north-east passage. In his second voyage in 1608 he reached Nova Zembla. He undertook a third voyage in 1609 from Amsterdam, at the expense of the Dutch East India Company. Giving up all hope of finding a north-east passage, he sailed for Davis Strait, then steered southwards in search of a passage, discovered the mouth of the river which now bears his name, and sailed up its waters for 150 miles. He sailed upon his last voyage in April 1610, in the *Discoverie* of 70 tons, and reached Greenland in June. Steering westward, he discovered the strait now known as Hudson Strait, and passed through it, and entered the great bay which has received the name of Hudson Bay. Although very insufficiently supplied with provisions, he resolved to winter in these desolate regions, in order to prosecute his discoveries further in the following spring. The food fell short, and the men, dissatisfied with Hudson's determination to continue the voyage, mutinied, and cast him adrift in a shallop, with eight others, on Midsummer Day 1611. The real ringleaders perished miserably in a scuffle with savages, and the survivors, after great suffering, reached England. See George Asher's *Henry Hudson, the Navigator* (Hakluyt Society, 1860).

Hudson Bay, a gulf, or rather inland sea, in the north-east of North America, is completely landlocked except on the north, where Southampton Island and Fox Channel lie between it and the Arctic Ocean, and where Hudson Strait, running 500 miles south-east, connects it with the Atlantic. Including its south-eastern extension, James's Bay (q.v.), it measures about 1000 miles in length and 600 in average width, and has an area of some 500,000 sq. m. The eastern shore, called the East Main, is for the most part rocky, and is fenced with several small islands; the western shore, the West Main, is generally flat. This sea, the great drainage reservoir of the Canadian North-west Territories, receives the precipitation from over an area of nearly 3,000,000 sq. m. Of the numerous rivers which bring down this water only two need be mentioned—the Churchill, whose deep and narrow mouth forms the best harbour on the shores of Hudson Bay, and the Nelson, of whose total course of 400 miles only 70 or 80 are navigable. Hitherto the only business that has been to any extent developed in this region has been the fur trade of the Hudson Bay Company (q.v.), though fish-oil has also been exported. Of late years, however, a movement has been on foot for opening up a direct communication from England with Manitoba and the North-west of Canada by way of Hudson Bay and Strait. The scheme provides for a railway from Winnipeg to Fort Nelson on the bay, a distance of 650 miles, of which 40 miles were constructed by the end of 1890. The chief objection to the project is that, although the bay is quite easy to navigate, and is only covered with ice in winter to a distance of about 10 miles from the shore, yet the passage of Arctic drift-ice through Fox Channel and Hudson Strait in early summer renders the successful navigation of the latter waterway somewhat uncertain. The strait can, however, be traversed by vessels on an average for about three months annually. This route would effect a saving of 775 miles as compared with the route by way of Montreal, and of 1130 as compared with that by New York.

See *Captain W. Coats's Geography of Hudson's Bay, 1727–51*, edited by J. Barrow for the Hakluyt Society (1852); Dr Robert Bell in *Proc. Roy. Geog. Soc.* (1881); W. Shelford in *National Review* (1886); and C. R. Markham in *Proc. Roy. Geog. Soc.* (1888).

Hudson Bay Company, a corporation formed in 1670 by Prince Rupert and seventeen noblemen and gentlemen for importing into Great Britain furs and skins obtained by barter from the Indians of North America. The company was invested with the absolute proprietorship and the exclusive right of traffic over an undefined territory, which, under the name of Rupert's Land, comprised all the regions discovered, or to be discovered, within the entrance of Hudson Strait. This was taken as meaning all lands that drained into Hudson Bay or Hudson Strait. For more than a century, however, the grantees confined themselves to the coast districts. Down to 1713 they had also to contend against the hostile acts of the French of Canada, who destroyed their forts, ruined their goods, and captured their ships. But after Canada passed from the French to the British in 1763 adventurers from the great lakes began to penetrate, in quest of peltry, far up the Saskatchewan towards the Rocky Mountains. And their enterprises, coming to be prosecuted with more systematic energy, led in 1783 to the formation of the North-west Fur Company of Montreal. After a period of stubborn competition, the Hudson Bay Company coalesced with its formidable opponent in 1821. The sphere of their labours was now practically coincident with all British North America, between the Pacific and Atlantic, and the Arctic Ocean and the United States. In 1838 the Hudson Bay Company again acquired the sole right of trading for itself for a period of twenty-one years; on the expiry of this concession the fur trade in British North America was thrown open to the world. Finally, in 1869, the company made a formal cession to the British government of whatever territorial claims remained, receiving an indemnity of £300,000 from the Dominion of Canada, to which the whole territories were forthwith annexed. It was, however, stipulated that the company should retain all its forts, with 50,000 acres and one-twentieth of all the land lying within the 'fertile belt' from the Red River to the Rocky Mountains. Besides still

carrying on the business of collecting furs, the company now derives a large income from the sale of these conceded lands.

See Butler's *Great Lone Land* (1872), H. M. Robinson's *Great Fur Land* (New York, 1879), the History by Professor George Bryce (1900), and Beckles Willson's *The Great Company* (1900).

Hué, the capital of Annam, 10 miles from the mouth of the Hue River, or Tnongtien. In 1801 it was strongly fortified by French officers. The heart of the city is occupied by the palace; much of the rest of it is composed of mud huts. Since before Annam became a French protectorate, there has been a French resident at Hue; and since the treaty of Hué in 1884 there is a French garrison in Thuanan, the port of Hue. There is little industry in Hue, which has a population of 30,000 (with suburbs, 50,000), including a number of Chinese. See ANNAM.

Hue and Cry, a phrase derived from the old process of pursuit with horn and voice, used in old English law to describe the pursuit of felons. Whoever arrested the person pursued was protected; and it was the duty of all persons to join in a hue and cry. The *Hue and Cry*, a police gazette for advertising criminals, was established in 1710.

Hueffer, FRANCIS, musical critic and Provençal scholar, was born at Münster, in Westphalia, in 1845, studied at Berlin, Leipzig, and Paris, and settled in London in 1869. He soon became an authority on music, was musical critic of the *Times*, and was recognised as the champion in Britain of Wagner and Wagnerian music. In 1869 he edited the Provençal poet Guillem de Cabestanh, and in 1878 published *The Troubadours: a History of Provencal Life and Literature in the Middle Ages*. Two works on Wagner were from his pen—one in 1874, the other in the 'Great Musicians' series, in 1881. He died January 19, 1889.

Huelva, a thriving town of Spain, situated near the confluence of the Odiel and the Tinto, 68 miles by rail WSW. of Seville. Fishing and the plaiting of esparto grass are the chief industries. Huelva is the port for the important Rio Tinto copper-mines, in British hands, and a shipping place for wine. An iron pier was erected in 1889–90. Some 500,000 tons of copper ore, 450,000 of iron ore, besides manganese, quicksilver, wine, &c. are annually exported; the imports, especially coal and coke, iron and steel, amount to 150,000 tons. Pop. 19,000. The *province* of Huelva has an area of 3913 sq. m., and a pop. of 250,000.

Huerta, VICENTE GARCIA DE LA, a Spanish poet and critic, was born in 1730 at Zafra, in Estremadura, but spent the greater part of his life in Madrid, where he was head of the Royal Library, and where he died on 12th March 1787. His tragedy of *Raquel* (1778), founded upon the story of the love of King Alfonso VIII. for the fair Jewess Rachel, was received with great enthusiasm, and is still esteemed one of the best of modern Spanish tragedies. Huerta was a zealous but not always consistent opponent of the prevailing Gallicism of his own day. As a lyric and dramatic poet he shows great command of language and versification. His poems were published in two volumes in 1778–79, and again in *Biblioteca de Autores Españoles* (vol. lxi.). Huerta edited the *Teatro Español* (17 vols. 1785–86), a collection of the best works of the older Spanish dramatists.

Huesca, a very old and picturesque town of Spain, on the Isuela, 55 miles by a branch line NE. of Saragossa. Among its chief buildings are the cathedral (1400–1515), a beautiful Gothic edifice; the Romanesque church of San Pedro (1150–1241); the university, founded in 1354 by Pedro IV.; and a former palace of the kings of Aragon. The *Osca* of the Romans, where Sertorius was murdered in 72 B.C., Huesca afterwards became famous as a seat of learning. Tanning and manufactures of linens are here carried on to some extent. Pop. 13,043. The *province* of Huesca has an area of 5848 sq. m., and a pop. (1887) of 254,958.

Huescar, a town of Spain, 75 miles NE. of Granada. Pop. 7760.

Huet, PIERRE DANIEL, French scholar and polymath, was born at Caen, February 8, 1630. He was educated in the Jesuit school of Caen, and became a zealous pupil of Descartes and of Bochart. The latter he accompanied on a visit to Stockholm in 1652, when he discovered and transcribed the MS. of Origen which was the basis of his celebrated edition of that father fifteen years later. On his return home he gave himself up entirely to study. In 1661 he published his essay *De Interpretatione*. In 1670 he was appointed with Bossuet tutor of the dauphin, and in the same year wrote his *Essai sur l'Origine des Romains*. He took an active part also in preparing the Delphin edition of the classics. Having in 1676 taken holy orders, he was successively abbot of Aunay (1678), Bishop of Soissons (1685) and Avranches (1692), and abbot of Fontenay (1699). In 1679 appeared one of his most important books, *Demonstratio Evangelica*. In 1701 he withdrew to the Jesuits' house in Paris, where he died, 26th January 1721. During his episcopal career Huet published a couple of books on the Cartesian philosophy, another on reason and faith, and another on the site of the earthly paradise. To his latest years belong *Histoire du Commerce et de la Navigation des Anciens* (1716), and his autobiographical memoirs (1718). His works were published in a collected form in 1712, and a volume of *Huetiana* appeared in 1722. In this latter year Huet's *Traité de la Faiblesse de l'Esprit Humaine*, which excited much controversy, first saw the light. See his Latin autobiography (1713), the French Life by Bartholomess (1850), and an article in the *Quarterly*, 1855.

Hufeland, CHRISTOPH WILHELM, German physician, was born on 12th August 1762, at Langensalza, in Thuringia. After studying at Jena and Göttingen, he was appointed physician to the court of Weimar, where his father and his grandfather had previously filled the same office. In 1793 he was appointed professor of Medicine at Jena, and in 1798 went to Berlin to preside over the medical college there and the Charité Hospital. On the foundation of the university of Berlin in 1809 he became one of its professors. He died 25th August 1836. He had a very high reputation for skill as a physician, was greatly esteemed for his intellectual abilities and his fine character, and founded a number of benevolent societies and institutions. Of his published works the most notable were the famous *Makrobiotik*, or the art of prolonging life (1796; 8th ed. 1889), which was translated into almost all the languages of Europe; a work on the physical education of the young (1799; 12th ed. 1875); and *Enchiridion Medicum* (1836; 10th ed. 1857).

Hug, JOHANN LEONHARD, Catholic theologian, was born at Constance, June 1, 1765, entered into priest's orders in 1789, was appointed a professor of Theology at Freiburg in 1791, and died there, 11th March 1846. The most important fruit of his biblical researches was his *Introduction to the New Testament* (2 vols. 1808), which was translated into most of the European languages (Eng. by D. G. Wait, 1827).

Huggins, SIR WILLIAM, K.C.B. (1897), astronomer, was born in London on 7th February 1824.

Whilst still a youth his mind was attracted to the study of chemistry, magnetism, and allied branches of physical science. In 1852 he was elected a member of the Microscopical Society, and for some years laboured at the study of physiology, animal and vegetable, with the microscope. But having in 1855 built for his own private use an observatory at Upper Tulse Hill, near London, he began what proved to be the principal work of his lifetime —the study of the physical constitution of stars, planets, comets, and nebulæ. By researches on the sun's spectra and the spectra of certain comets, he ascertained that the luminous properties of the former are not the same as the luminous properties of the latter. Since 1875 he has been engaged photographing the ultra-violet parts of the spectra of the stars. He has also determined the amount of heat that reaches the earth from some of the fixed stars. Mr Huggins was elected a Fellow of the Royal Society in 1865. He was twice awarded the medal of the same society and twice the gold medal of the Royal Astronomical Society. In 1874 he became corresponding member of the Paris Academy of Sciences, and three years later corresponding member of the Royal Society of Göttingen. From 1876 to 1878 he was president of the Royal Astronomical Society.

Hugh, St, of Avalon, Bishop of Lincoln, was born of noble family at Avalon in Burgundy about 1135. On his mother's death his father entered a priory of regular canons at Villarbenoit, carrying with him the boy, then but eight years old. At nineteen he was ordained deacon, and was already remarkable for his holiness of life and ascetic austerity. Ere long he was attracted by the severer discipline of the Grande Chartreuse, and thither he repaired, although he had taken an oath to his superior not to do so. Here he remained ten years, received his priest's orders, and was for his practical ability appointed bursar to the monastery. His fame came to the ears of Henry II., who prevailed upon him to accept the government of the struggling Carthusian monastery at Witham in Somersetshire, and summoned him hence in May 1186 to fill the bishopric of Lincoln. For fourteen years he governed his diocese with great wisdom and vigour, retiring every year a short time to Witham for his soul's health. His unworldly holiness gave him great influence, not only over Henry II., but also his successors Richard and John. He did not leave off his frank outspokenness of speech and his quick wit even in the presence of the king. Withal his charity was so remarkable that even the Jews of Lincoln are said to have wept at his funeral. All his life he had been notable for his love of birds, and at his residence at Stow, near Lincoln, he had a pet swan whose affection for its master appeared to beholders to be more than natural. The swan usually appears in representations of the saint. Soon after his accession to the episcopal throne he had begun with vigour the rebuilding of his cathedral, and he lived to see the completion of the choir and eastern transepts. But indeed, with the exception of the presbytery, the entire church, as it now dominates Lincoln, was conceived in the mind of Hugh's architect, and gradually perfected under his successors. Hugh visited his native country in 1200, and on his return journey was seized with illness, and died at London 16th November 1200. He was canonised in 1220, and for long miracles were wrought at his tomb, and his cult was almost as popular as that of St Thomas in the south.

Both the *Metrical Life of St Hugh of Avalon* (1860) and the *Magna Vita S. Hugonis* (1864), the latter most likely written by his domestic chaplain, Adam, abbot of Evesham, were edited by the Rev. J. F. Dimock. A Life by Giraldus is printed in vol. vii. (1877) of the works of Giraldus Cambrensis. See also Canon Perry's *Life of St Hugh of Avalon* (1879).

Hugh of Lincoln, a boy supposed to have been murdered by the Jews of Lincoln, as told both in English traditional ballads and early chronicles. Professor Child (No. 155) gives no fewer than eighteen versions of ballads on this theme, which agree marvellously even in detail. A group of boys playing at foot or at hand ball are joined by the young Hugh or Sir Hugh, who drives the ball through a Jew's window, is enticed into the house by the Jew's daughter, cruelly murdered and flung into a well, from which he speaks miraculously, whereby the murder is discovered. The story of Hugh of Lincoln is told in the *Annals of Waverley*, under the year 1255, by a contemporary writer. Here the boy is tortured by the Jews, and finally crucified in contempt of Christ. His body is discovered by miraculous means, and eighteen Jews are hanged for their share in the crime. Additional circumstances are found in Matthew Paris. The story occurs simultaneously in several Anglo-French ballads; and Chaucer's *Prioresses Tale* is an artistic elaboration of the theme.

We find more or less circumstantial versions of the same story not only at Lincoln, but at Norwich, Gloucester, London, and Northampton; at Blois, at Saragossa, and Valladolid; at Frisingen and Zurich; at Prague and Cracow, Pavia and Venice, and very frequently among the German peoples, as at Vienna, Erfurt, Magdeburg, Mainz, Munich, Breslau, and Ratisbon. Besides the desire to deride the Passion, an additional motive was invented, that the Jews sought to obtain blood for use in the Paschal rites—a charge ridiculously at variance both with Jewish precept and practice. This singular notion has survived persistently for over 600 years, and has formed a pretext for cruel and shameful wrong down to our own day. It is still a firmly-held popular notion in Russia, Hungary, at Smyrna and Alexandria; indeed it was only so late as August 1883 that fifteen Jews were acquitted after over a year's imprisonment for the alleged kidnapping of a young girl at Tisza-Eszlár, and that the good Christians of Budapest plundered the Jewish shops in their disappointment.

See the Chaucer Society's *Originals and Analogues of Chaucer's Canterbury Tales* for 1875–76; Child's *English and Scottish Popular Ballads* (1888); and *The Life and Miracles of St William of Norwich*, edited by Jessopp and James (1897).

Hugh Capet. See Capetian Dynasty.

Hughenden (locally *Hitchendon*), a parish of Buckinghamshire, among the Chiltern Hills, 2 miles N. of High Wycombe. Hughenden Manor, a large brick three-story mansion, mostly modern, was purchased before 1847 by Benjamin Disraeli, Earl of Beaconsfield. It is rich in interesting portraits; and in its terraced gardens are trees planted by Queen Victoria in 1877 and the Prince of Wales in 1880. The ancient parish church, much restored in 1874, contains a monument to the earl, erected by the Queen; and in its vault he lies buried by the side of Lady Beaconsfield.

Hughes, Thomas, author of *Tom Brown's School-days*, second son of John Hughes, Esq., of Donnington Priory, near Newbury, in Berkshire, was born at Uffington, Berks, October 23, 1823. He was educated at Rugby under the celebrated Dr Arnold; entered Oriel College, Oxford, in 1841, and took his degree of B.A. in 1845; was called to the bar at Lincoln's Inn in 1848, and became a member of the Chancery Bar. In 1856 he gave to the world *Tom Brown's School-days*, a vivid and truthful picture of life at Rugby, evidently written from the author's own boyish impressions. It is the highest praise to say that it admirably supple-

ments Stanley's life as a picture of the greatest of modern teachers. It was followed in 1858 by *The Scouring of the White Horse*; in 1861 by *Tom Brown at Oxford*, in which the mental history of his hero is continued, with sketches of college life and incidents; and in 1869 by *Alfred the Great*. Hughes pursued meanwhile the practice of the law, became Q.C. in 1869, and a County Court judge in 1882. He associated early with Maurice and Kingsley in their work of social and sanitary reform among the London poor, and while he had gained the confidence and good-will of the working-classes by his endeavours to promote a better understanding between masters and men, and by teaching the latter the value of co-operation, he has never failed courageously to rebuke the narrow prejudices and mischievous views held by certain members of trades-unions. At the general election for Lambeth in 1865 he was placed at the head of the poll. He was returned for Frome in 1868, which he continued to represent till 1874, and always took a prominent part in debates relating to trades-unions and the like. In 1880 he assisted in founding a settlement in the United States, described in *Rugby, Tennessee* (1881). He also wrote *Memoirs of a Brother* (1873), Lives of Daniel Macmillan (1882) and Bishop Fraser (1887), *Vacation Rambles* (1895), and the article MAURICE in this work. He died 22d March 1896.

Húglí. See HOOGHLY.

Hugo, VICTOR-MARIE (1802–85), was the son of a Lorrainer and a Breton, and was born at Besançon. His father, General Hugo, was on active service, so that his earlier years were mostly spent in the track of the emperor's armies. He was educated partly in Paris at the Feuillantines (1809–11, 1813–15), partly in Madrid (1812), and partly at the École Polytechnique, where he read mathematics and practised poetry. At fourteen he produced a tragedy; at fifteen he went near to winning a prize at an Académie competition; and at twenty, when he published his first set of *Odes et Ballades* (1822), he had thrice been victor at the Floral Games of Toulouse. The next year, being by this time a married man and the *enfant sublime* of M. de Chateaubriand, he published his *Hans d'Islande* (1823), that wild and whirling romance of an impossible Iceland; and followed it up with *Bug-Jargal* (1824), a second set of *Odes et Ballades* (1826), and the famous *Cromwell* (1827), thanks to which last—a tragedy even then impossible to act and now almost as difficult to read—he became the most conspicuous figure in æsthetic France. For Romanticism—that protest in action against the effete and hidebound conventions of the age of Louis XIV.—was now by way of being an accomplished fact; and the preface to *Cromwell* was greeted with an enthusiasm of approval on the one hand and of detestation on the other in these days not easy to understand. In its way, indeed, it is a document of singular importance in literary history. It is largely compacted of paradox and antithesis no doubt; and no doubt its premises are mostly dubious and its conclusions not more than fantastic. But it asserted the artist's right to be as Shakespearian—that is, as lawless—as he pleased, and it was so completely a declaration of independence, and a decree of emancipation, that, whatever happens, the literature of France can never wholly recover from its effect.

The time indeed was big with revolution and with change, and Hugo's manifesto was accepted by the Romanticists with the solemnity of absolute conviction, so that he instantly took his place by right of genius and authority at the head of the literary host. He was fully equal to the charge of course: for while he was far and away the greatest artist in words that modern France has seen, he was also very careful and curious in the work of 'engineering a reputation,' and contrived to take himself and his function so seriously that to his followers he was not much below divinity itself. It is said that he made himself a forehead: and it is certain that while M. Rodin's magnificent bust of him is far less suggestive of Apollo than of Hercules, the Hugo brow—enormous, radiant, 'prone with excess of mind'—appears and reappears in contemporary caricature with all the persistency and more than the effect of Gillray's view of the 'Bottomless Pitt.' It is certain, too, that the first sketch of his life and work that got into print was written in his own house, and was the work of his own wife; and as Mme. Hugo never wrote again, it is legitimate to argue that the hero may very possibly have lent a hand to the epic. But he never ceased from achievement; and his achievement was inevitably that of a great artist in speech. In 1828 he published his *Orientales*, wherein he revealed himself for such a master of rhythms, such an inventor in style, such an adept in the mystery of the use of words as France had never seen. The year 1830 was the great year of *Hernani*—the first in fact and the second in time of those 'five-act lyrics' of which Hugo's drama is composed. In so far as it relates to drama—material, structure, amount, movement, the presentation of emotion in action—the question had been settled now and for all time by Dumas the year before; but Dumas was not a writer in the sense that Hugo was, and the battle of style was still to fight, and the battlefield was the Théâtre-Français, and the *casus belli* was *Hernani*. It is so brilliantly written, the movement of the verse is so victorious and the diction is so gorgeous, that even now it takes one time and patience and a certain familiarity to see that, while constructed in the formula of *Henri Trois et sa Cour*, it is no more a play than *Samson Agonistes*. In those days men had neither time nor patience, while as for familiarity! . . . It was enough that to one side the verse was incomparable, and that to another it was the Accursed Thing. As Hugo took care to pack as much of the house as he could get made over to him with Romantics, and as on the other part the Classicists were to the full as eager for the quarrel, the question of what is and what is not style was argued for many nights on end with a vehemence—sometimes attaining to the inspiration of assault and battery—which has made 1830, as the year of *Hernani*, a sacred date—as who should say a species of Hegira in the annals of Romanticism.

In 1831 Hugo published *Notre Dame de Paris*, a pretentious but picturesque and moving historical romance in which he enters into competition with Sir Walter and comes badly off, and *Les Feuilles d'Automne*, a sheaf of lyric and contemplative verse in which is included some of his best poetry; and brought out his best play, *Marion Delorme*, at the Théâtre-Français. In 1832 he produced *Le Roi s'amuse*, which was interdicted after the first night, and of which the best that can be said is that it is superbly written and that it has gone the round of the world as *Rigoletto*. The next year was that of *Lucrèce Borgia* and *Marie Tudor*, the first a good and stirring melodrama, the second a farrago of unveracities of all kinds—moral, historical, dramatic, and the rest; in 1834 came *Claude Gueux*, which is pure humanitarian sentimentalism, and the *Littérature et Philosophie Mêlées*, a collection of juvenilia in prose, all carefully dated and all as carefully rewritten or revised. Followed in 1835 *Angelo*, a third melo-

drama in prose, and the admirable lyrism of *Les Chants du Crépuscule;* in 1836 *La Esmeralda* (an opera for Mdlle. Bertin); in 1837, *Les Voix Intérieures*, in which, as in *Les Feuilles d'Automne*, the poet's genius of diction is held by some to have found its noblest expression; in 1838, *Ruy Blas*, after *Hernani* the most famous of his stage rhapsodies; and in 1840, *Les Rayons et les Ombres*, yet another collection of brilliant and sonorous verse; after which the prodigious affluence of creativeness to which all those were due appears to have been momentarily exhausted. Certain it is that Hugo published no more until 1843, when he again failed at the Français with that ponderous trilogy of *Les Burgraves*, surcharged with as it were an Æschylean sentimentalism. His next essay in pure art was not put forth till 1856, the dozen or fifteen years between being very largely given over to the pursuit of politics and the practice of oratory, journalism, and pamphleteering in prose and verse.

Putting it roughly, Hugo was until 1830 a Royalist, and worshipped Napoleon; and between 1830 and 1848 he was a Napoleonist with a turn for humanitarianism, but more or less resolute in the cause of order and law. In this latter capacity it was that he sat for the city of Paris in the Assemblée Constituante. There he voted now with the Right and now with the Left, so that, when on his election to the Assemblée Législative he threw in his lot with the democratic republicans, the reproach of apostasy was by no means unfounded. It is not clear that he would have been finally content with any change in the condition of things at this time—always excepting such a turn of the wheel as would have brought himself to the top and kept him there as a kind of emperor by the grace of genius and the democracy. But it is plain that he was bitterly dissatisfied with things as they were, even as it is plain that he could neither endure the eminence of Montalembert nor consider with patience and dignity the fact of the popularity of the prince-president. In 1852, after the *coup d'état*, he withdrew to Jersey, whence he issued his *Napoléon le Petit*, perhaps the most mannered and the least literary of all his works, and in 1853 *Les Châtiments*, which is certainly the greatest achievement in the fusion of pure poetry with political and personal satire in all literature. Three years after appeared *Les Contemplations*, a gathering of poems elegiacal, reflective, and lyrical, remarkable for beauty of expression and comparative simplicity of style; and three years after that the wonderful and often bewildering *Légende des Siècles* (1859). Still another silence of three years was broken by the publication (in ten languages) of *Les Misérables* (1862), a panoramic romance of modern life, mannered beyond measure in style and abounding in absurdities and *longueurs*, but including also not a little of Hugo's sincerest and most touching invention and achievement; and this in its turn was followed by the extraordinary rhapsody called *William Shakespeare* (1864), and by *Les Chansons des Rues et des Bois* (1865), a book of verses which is at the same time a little gallery of achievements in style; by *Les Travailleurs de la Mer*, an idyll of passion, adventure, and self-sacrifice; by *L'Homme qui Rit*, a piece of fiction whose purpose and tenor are intended to be historical, and whose effect is sometimes to overwhelm the reader, often to weary him, and still more often to amuse. Returning to Paris after the Fourth of September, Hugo at once distinguished himself by summoning the Germans to withdraw from France and proclaim the German Republic. Some five or six months after he was chosen to represent the Seine, but soon resigned his seat on the ground that one of his speeches was interrupted by the Right. He stayed on through the rule of the Commune, and defended the Vendôme Column while he could; and then, departing for Brussels, he protested publicly against the action of the Belgian government in respect of the beaten Communists, the effects of which proceeding were that the populace rose against him, and that he was expelled the kingdom. Again he stood for Paris, but was beaten by a majority of 27,000 on a register of 231,000. In 1872 he published *L'Année Terrible*, a series of pictures of the war, diatribes against Germany, and eulogies of France, which are often eloquent and are sometimes poetry; in 1874 his last romance in prose, the much-debated *Quatre-Vingt-Treize;* in 1875-76 a complete collection of his speeches and addresses. In 1876 he was made a senator, and published the second part of the *Légende;* 1877 was the year of the *Histoire d'un Crime*, which has been fairly enough described as 'the apotheosis of the Special Correspondent,' and of *L'Art d'être Grand-père*, wherein, with much charming verse, are good store of conceits and no small amount of what some one has called 'the pedantry of sentimentalism;' 1878 and 1879 enriched us with *Le Pape*—a piece humanitarian, anti-clerical, and above all theatrical, which they may praise who can—and *La Pitié Suprême*, the effect of which is much the same, and which—like *L'Âne* (1880), and a great deal of *Les Quatre Vents de l'Esprit* (1881), and *Torquemada* (1882)—is merely Hugo in decay. His mastery of words remains invariable, his accomplishment is always superb; but all too frequently he produces antithesis under the delusion that he is expressing ideas, he parades all manner of affectations with the air of one reviewing a Tenth Legion or Old Guard (so to speak) of the sentiments, he continually mistakes preposterousness for grandeur; he falls a prey to any of the eternal unveracities he may chance to encounter; his 'philosophy' is a mere effect of appetite, and as always his depressing lack of humour is 'not merely zero, but even a frightful *minus* quantity,' so that he abides in error with a seriousness ridiculous indeed. But genius is always genius, and temperament never ceases from being temperament; and the final impression is one of unsurpassed accomplishment and abounding mental and emotional activity. So that Hugo died the foremost man of letters of his time, and they were few indeed who grudged him the public funeral with which he was dignified, and in which the pauper's hearse that bore him tombwards—(the invention was wholly his own)—was followed by the best and the worst of living France.

Hugo's work is vitiated as an expression of life by the presence of an abounding insincerity in combination with a quality of self-sufficiency so inordinate as scarce to be distinguished now and then from an immense stupidity. In truth he does but seem to create: his personages—Cimourdain, Josiane, Didier, Ursus, Ruy Gomez de Silva, Claude Frollo, Lantenac, Lucrèce Borgia, Javert, and Myriel, the very *pleurre* of *Les Travailleurs de la Mer*, are all expressions not of humanity but of Victor Hugo. You would believe in them—and in him—if you could; but you cannot, for he takes care to make belief impossible. His plays are sometimes well made, are always heavily decorated, are all magnificently written, and have all had their chance of immortality. But their author is Victor Hugo, and the situations are abnormal, the personages peculiar, the interests remote from experience, and such motive as is developed is too individual and strange to be felt beyond the footlights. Much the same is true of his prose romance; but while the level of style is nothing like so high as in the plays, it has merits—of invention, pathos and

terror, presentation -absent from these, and which made him one of the most popular writers of his epoch. That said, it may be added that to talk of Hugo as either a dramatist or a master of romantic fiction is to beg the question of Hugo's greatness. His prose, as prose, has never the easy, voluptuous, natural eloquence of George Sand's, nor the mordant felicity of Mérimée's, nor the spontaneity and vivacity of Dumas's, nor the terrible yet irresistible persuasiveness of the opening chapters of Musset's *Confession d'un Enfant du Siècle*. His dramas are only so many lyrical expressions of Hugolatry, the work of the arch-Hugolater. His best and truest title to immortality is his poetry. In truth, the range and the capacity of his genius in rhythm and rhyme are unparalleled in the literature of France. It was for Musset to utter the truest note, and to make the invention speak the very language of the heart; it has been for Leconte de Lisle, for Baudelaire, for Gautier to produce impeccable work each after his kind; but assuredly it was for Hugo to accomplish the most gorgeous and the most heroic achievement in the divine art of song. His verse, with its infinite capacity of violence and calm, sunshine and thunder, apocalyptic fury and grace ineffable, has something of the effect of the multitudinous seas as he saw and described them from his eyrie in midchannel. The effect of his alexandrines, with their wealth of colour and light and energy, may fairly be paralleled with that of Shakespeare's iambics; while in their purity of form, the sweetness and distinction of their cadences, their richness of rhyme, their magical felicity of expression, his lyrical measures put the Pleiad and all its works to shame. There can be no possible doubt that in many of the relations of life Hugo was a *poseur* of the first magnitude—that from the first he humbugged his contemporaries with a pertinacity and a success that are only equalled by his faculty of taking himself seriously. But there can be as little that while essentially un-French—a combination, indeed, of Teuton and Celt, and moreover absolutely lacking in sanity—he was a lyrist of the first order, a master of words and cadences, an artist in rhythms and rhymes.

See *Victor Hugo raconté par un Témoin de sa Vie* (1863) by his wife, who died at Brussels in 1868; works on him by Rivel (1878), Paul de Saint Victor (1885), Barbou (1881), Asseline (1885), Biré (three mainly hostile books, 1883-93), Dupuy (two books, 1887-90), Mabilleau (1893), Boudon (4th ed. 1893), Renouvier (1893); Swinburne, *A Study of Victor Hugo* (1886), and English works by Barnett Smith (1885), and J. P. Nichol (1892); and criticisms by Gautier, Banville, Baudelaire, and Sainte Beuve.—His son Charles (1826-71), publicist and novelist, was the father of the 'George' and 'Jeanne' of *L'Art de devenir Grandpère*; François (1828-73) trans. Shakespeare.

Huguenots (from the Genevese nickname *eiguenot*, Ger. *eidgenosse*), the name formerly given in France to the adherents of the Reformation, which movement commenced almost simultaneously in France and Germany. One of the most eminent names in the early history of French Protestantism is that of Farel (q.v.), and one of the first supporters of its cause was Margaret of Valois, queen of Navarre, the sister of Francis I. Subsequently, in the time of Calvin, many of the nobles and middle classes embraced the reformed religion. Francis I., however, opposed it with great severity, and caused many to be burned as heretics. The alliance of Henry II. with the German Protestants gave at first an impulse to the cause of the Reformation, but the aspect of things was again changed when the family of Guise obtained ascendency at court. Under Francis II. a chamber (*chambre ardente*) was established in each parliament for the punishment of Protestants; and executions, confiscations, and banishments were common in all parts of the kingdom. The Protestants took up arms against the government, choosing Louis I., Prince of Bourbon-Condé, for their leader. On February 1, 1560, in a meeting at Nantes, they resolved to petition the king for freedom of religion and for the removal of the Guises; and in the event of his refusal, to seize the king's person, and proclaim Condé governor-general of the kingdom. But the court, being apprised of the conspiracy, fled from Blois to Amboise, and the Duke of Guise was appointed governor-general. Some bands of Protestants, approaching Amboise with weapons in their hands, were easily defeated and taken; 1200 died by the hand of the executioner. The Edict of Romorantin, in May 1560, took the prosecution of heretics out of the hands of the parliament, and gave it into those of the bishops. Whilst the Guises plotted the death of the Protestant leaders Charles IX. ascended the throne, a prince not yet of age; and the queen-mother, Catharine de' Medici (q.v.), having removed the Guises from the helm of the state, was compelled to seek the support of the Protestants against them and their party. In July 1561 appeared an edict which freed the Huguenots from the penalty of death. For the complete termination of strife the court opened a religious conference at Poissy. The chief disputants were the Cardinal of Lorraine on the one side, and Theodore Beza (q.v.) on the other. The effect of the discussion was to unite and embolden the Protestants, with whom the machinations of the Guises forced Catharine into closer alliance. In 1562 appeared an edict giving noblemen the right of the free exercise of their religion on their own estates.

In March of the same year, a company of Protestants met in a barn at Vassy for religious exercises was attacked, and many of them were massacred by the followers of the Duke of Guise. On this Condé hastened to Orleans, and called his co-religionists again to his standard; whilst the Guises took possession of the persons of the king and his mother, and proclaimed the Protestants rebels. In September the royal troops took Rouen, and in December a battle was fought at Dreux, in which, after a hard struggle, the Protestants were defeated. The Duke of Guise marched on Orleans, but was assassinated in his camp before that city, February 18, 1563. Hereupon the queen-mother hastened to conclude the peace of Amboise, by which the Protestants were allowed the free exercise of their religion, except in certain districts and towns. Catharine, however, formed a close alliance with the Spaniards for the extirpation of heresy, retrenched the new liberties of the Protestants, and made attempts upon the life of Condé and of the Admiral Coligny (q.v.). These leaders of the Protestant party adopted the resolution of taking possession of the king's person. The court fled to Paris, which Condé invested; but in November 1567 a battle was fought at St Denis between Condé and the Constable Montmorency, in consequence of which Condé fell back into Lorraine; and in March 1568 Catharine concluded peace at Longjumeau. Nevertheless she persecuted the Protestants, of whom 3000 were assassinated or executed. The Protestants having, however, received assistance in troops from Germany, and in money and artillery from England, began the third religious war. But on March 13, 1569, they were defeated, and Condé their leader slain, at Jarnac by the royal troops under the Duke of Anjou, afterwards Henry III. Jeanne d'Albret, queen of Navarre, endeavoured to reanimate the Protestants, and set up her son, afterwards Henry IV., as the head of the Protestant cause. Coligny having received further assistance of

troops from Germany, laid siege to Poitiers, but was again defeated by the Duke of Anjou at Moncontour. Fresh reinforcements from England, Switzerland, and Germany enabled Coligny to take Nimes in 1569, and to relieve La Rochelle, whilst Lanoue obtained a victory over the royal troops at Luçon. Catharine and her son now sought for peace; and a treaty, concluded at St Germain-en-Laye in August 1570, gave to the Protestants an amnesty, the free exercise of their religion everywhere except in Paris, and the possession of a number of places of security.

Catharine, having failed to overthrow the Protestant cause in the open field, sought to accomplish her object by treachery; and by a general massacre of Protestants on St Bartholomew's Day (q.v.) 1572, 30,000 Huguenots were slain within two months in Paris and in the provinces. Although deprived of their leaders, and weakened by the slaughter of great numbers of their best and bravest, the Protestants flew to arms. The Duke of Anjou, after having lost his army before La Rochelle, took advantage of his election to the throne of Poland, and in 1573 concluded a peace by which the Protestants obtained the free exercise of their religion in their places of security, Montauban, Nimes, and La Rochelle. A section of the Roman Catholic nobility, at whose head was the Duke of Alençon, the youngest son of Catharine, from purely political motives united with the Protestants in opposition to the queen-mother and the Guises. Catharine, therefore, incited her third son, now Henry III., immediately to recommence hostilities against the Protestants. But, contrary to all expectation, the Protestant cause was in the highest degree prosperous during the year 1575. A peace was concluded at Beaulieu by which the Protestants were freed from all restrictions in the exercise of their religion, and obtained eight new places of security. The Duke of Guise originated a Catholic association, called the Holy League, at the head of which the king put himself in the Assembly of the States at Blois in 1576, and the sixth religious war began. Peace was, however, again concluded by the king himself at Bergerac, in 1577, on the former conditions; and Catharine, to diminish the power of the Duke of Guise, entered into a private treaty with Henry of Navarre. The terms of peace being violated by the court, Henry I., Prince of Condé, son of Louis I., commenced the seventh religious war (called the *guerre des amoureux*) in November 1579; but he and his colleague Henry of Navarre being vanquished, peace was concluded at Fleix, November 1580.

There was now a comparatively long interval of repose till 1584, when, by the death of the Duke of Anjou (formerly of Alençon), Henry of Navarre became heir to the throne of France. Hereupon Henry, Duke of Guise, exerted himself for the revival of the League, entered into an alliance with Spain and the pope for the extirpation of heresy, declared the Cardinal of Bourbon heir to the throne, and began hostilities against the Protestants. This war is commonly known as the 'war of the three Henries.' The king soon made terms with Guise, and declared all the privileges of the Protestants to be forfeited. The Protestants, having obtained troops from Germany and money from England, entered on the eighth religious war, Henry of Navarre commanding the Protestant army. The Duke of Guise, in the midst of these troubles, grasped the whole power of the state. But his designs with regard to the throne having become very evident, the king caused him and his brother the cardinal to be assassinated at the Assembly of the States at Blois in September 1588. In less than a year the king was himself assassinated by a monk named Jacques Clément, and Henry of Navarre succeeded to the throne, and signed the famous Edict of Nantes (see NANTES) on 13th April 1598.

Under the reign of Henry IV. the Protestants lived in tranquillity. But when, during the minority of Louis XIII., Mary de' Medici, the queen of Henry IV., assumed the reins of government, the marriage treaties with the Spanish court excited the apprehensions of the Protestants to such a degree that in November 1615 the Prince of Condé set up the standard of rebellion. In spite of the treaty of Loudun (1616), in June 1617 a royal edict commanded the entire suppression at once of the Protestant Church and of political privileges in the province of Béarn; an edict not carried into full effect till 1620. Hostilities again broke out in May 1621. At the head of the Protestants were the two brothers, the Duke of Rohan and the Prince Soubise. Their cause, however, was feebly maintained; and after the capitulation of Montpellier, 21st October 1622, there followed a general peace, by which the Edict of Nantes was confirmed, but the right of prohibiting the assemblies of the Protestants was assumed on the part of the crown. The court, however, paid little attention to the treaty, and the Protestants again rose in arms. Soubise, with a fleet furnished by the town of La Rochelle, oftener than once defeated the weak royal navy; and Cardinal Richelieu (q.v.) resolved upon the capture of La Rochelle. This he accomplished after a heroic resistance by the inhabitants. The fall of La Rochelle was speedily followed by that of Nimes, Montauban, Castres, and all the other Protestant strongholds. Now left defenceless, and bereft of all political power, the Protestants were entirely dependent on the will of the court, which, however, made no attempt to deprive them of their liberty of conscience. It was Louis XIV. who, at the instigation of Madame de Maintenon and his confessor Lachaise, commenced anew the persecution of the Protestants, gradually deprived them of their equal civil rights, and endeavoured to put down the Protestant Church altogether. Bodies of troops, accompanied by monks, passed through the southern provinces, compelling the inhabitants to renounce their religion, demolishing the places of worship, and putting to death the preachers (see DRAGONNADES). Fénelon was conspicuous for his zeal in seeking the conversion of Protestants. Hundreds of thousands fled to Switzerland, the Netherlands, England, and Germany. Many Protestants also made an insincere profession of Roman Catholicism. On 23d October 1685 Louis at last revoked the Edict of Nantes. Hereupon began a new flight, followed by a still more fearful persecution of the Protestants. Their marriages were declared null; their children deprived of the right of inheritance, and forcibly shut up in convents; their preachers indiscriminately put to death. From the vicinity of Nimes, where they had always been very numerous, thousands betook themselves to the mountains of the Cévennes, and continued the exercise of their religion in secret. Amongst these and the mountaineers of the Cévennes a remarkable fanatical enthusiasm displayed itself, and, under the name of Camisards (q.v.), they maintained for a number of years a wonderfully successful opposition to the forces of the great monarchy. The War of the Cévennes, or Camisard War, was not terminated till 1706, the suppression of the local rebellion being attended with circumstances of great cruelty. France lost in twenty years more than half a million of her most active, enterprising, and industrious citizens; and, notwithstanding all the persecutions, about two millions continued to adhere to the Protestant religion.

The partial repose which the Protestants enjoyed for more than ten years was attended by a revival of their worship, especially in Provence and Dauphiné. In 1724, therefore, Louis XV., at the instigation of the Jesuits, issued a severe edict against them. The spirit of the age, however, now began to be opposed to persecution. An edict of 1752 declared marriages and baptisms by Protestant ministers to be null, and required the repetition of them by the Roman Catholic clergy. But when, upon this, many began again to flee from their country, the disgust of the Roman Catholics themselves was so much excited that the court recalled the edict. Montesquieu successfully advocated the cause of toleration; Voltaire did much to promote it by his exposure of the judicial murder of John Calas (q.v.). At last, by an edict in 1787, which indeed was not registered by the parliament till 1789, Louis XVI. declared the Protestant marriages and baptisms to be valid, and restored to the Protestants equal civil rights, except that they might not be advanced to public offices and dignities. Even in 1789 a proposal for the complete emancipation of the Protestants was rejected by the National Assembly, which, however, admitted Protestants, and even Protestant preachers, as members without objection; and in 1790 it passed a decree for the restitution of all the properties of non-Catholics confiscated since the time of Louis XIV. The *Code Napoléon* gave Protestants in France equal civil and political rights with Roman Catholics. The charter granted by the Bourbons acknowledged the freedom of Protestant worship, and the state pledged itself for the maintenance of the pastors; yet under the government of the Restoration the privileges of Protestants were in many ways circumscribed. After the revolution of July 1830 the Reformed Charter of France proclaimed universal freedom of conscience and of worship, which principle has been maintained in subsequent changes. Protestants were no longer subjected to many exceptional hardships, and in various important instances were protected by Napoleon III. from the arbitrary exercise of power attempted by illiberal local magistrates adverse to their religion. But the *recognised* Protestant Church—in which are included both Reformed and Lutherans, and of which the pastors receive small salaries from the state (see FRANCE)—was not till 1872 permitted to hold synods or general assemblies or to proselytise. At a synod held in that year the conservative party in the church, in spite of some opposition, carried their proposal that the church, which had long been without a formally binding creed, should adopt an evangelical confession. French Protestants now number 700,000 approximately, with 1400 places of worship and 950 ministers.

The first Huguenot churches in England date from the 16th century, as also the introduction of the Huguenot industries, such as the woollen, worsted, and napery trades, silk-weaving, tapestry, dyeing, glass-making, pottery, and paper-making. Under Charles II. the Savoy in London was granted to the Huguenots as a place of worship, a fashionable West-end church, in which, as a token of 'conformity,' the Common Prayer-book was read in French. From 1685 onwards thousands and thousands of Huguenots found their way to England, and gave William of Orange the support of their military talent, political interest, and financial resources. The planting of Protestantism in Ireland was greatly due to the services of the Huguenots Schomberg and Ruvigny. Under Queen Anne there were thirty Huguenot churches in London alone. Towards the close of the century more than half had disappeared through the rapid absorption of the Huguenot families in the Anglican Church, and their rise to the first ranks in the gentry of England. Members of the Saurin family sat among the bishops, the son of Peter Allix became dean of Ely, the son of Casaubon was rector of Ickham, the families of Chenevix and Trench gave archbishops to Dublin and Tuam, and that of Romaine clergymen to London. Cavalier and Ligonier served under the British flag, Romilly adorned English law, the Martineaus shine in English letters; the Beauforts, Boileaus, Bosanquets, Bourdillons, Cazenoves, De Crespignys, De Villiers, Du Canes, Gossets, Layards, Millais are only a few instances taken at random out of several hundred family names of Huguenot origin.

See Rulhiere, *Eclaircissements Historiques sur les Causes de la Revocation de l'Edit des Nantes* (1788; Felice, *Hist. des Protestants en France* (1851); Haag, *La France Protestante* (1859; new ed. 1883); the works of Capefigue (1838) and Agnesse (1882); Smiles, *The Huguenots in England* (1867); H. M. Baird, *Rise of the Huguenots* (1880), and a series of three other works on their history (1885-95); R. L. Poole, *The Huguenots of the Dispersion* (1880); *Bulletin de l'Histoire du Protestantisme Français*; Transactions and publications of the Huguenot Society of London, established in 1885. See also the articles FRANCE, MAROT, HENRY IV., &c.

Huia-bird (*Heteralocha acutirostris*), a remarkable New Zealand starling, now restricted to a few wooded and mountainous regions. The plumage is black, except on the white tips of the tail feathers; there is a wattle at the corner of the mouth; the bill of the female is strikingly different from that of her mate, being long, much curved, and pliant, instead of straight and strong as in the male. The difference is so marked that the two sexes were formerly referred to distinct species. In digging grubs out of wood the two kinds of bills supplement one another. The birds, which are becoming rare, submit readily to captivity.

Hulks. See PRISONS, Vol. VIII., p. 418.

Hull, or KINGSTON-ON-HULL, an important and flourishing English river-port, a parliamentary and municipal borough and county of itself, is situated in the East Riding of Yorkshire, in a low, level plain on the north bank of the Humber, here 2 miles wide, and here joined by the Hull, 42 miles ESE. of York and 173 N. of London. Of churches the most notable are Holy Trinity, Decorated and Perpendicular in style, with a central tower 140 feet high; and St Mary's Lowgate (1333), one-half of which was removed to make room for the mansion-house of Henry VIII., who stayed here in 1540. Both were restored by Sir G. G. Scott. All Saints' Church (1869), from designs of Street, is a good example of a brick church. The most important educational establishments are Hull and East Riding College; the Hull grammar-school (1486), where Andrew Marvell was educated; and Trinity House School (1716), where a large number of boys receive a nautical education; to which may be added the Literary and Philosophical Society, the Royal Institution, the Hull Church Institute, Young People's Christian Institution, Literary Club, College of Chemistry, Mechanics' Institute, the School of Art. An equestrian statue (1734) of William III. stands in the market-place, and in Junction Street is a column (1834) surmounted by a statue of Wilberforce, who was a native, as also was Mason the poet. Among many other benevolent establishments, the Trinity House, instituted in 1369, but rebuilt in 1753, for the relief of decayed seamen, and the Charterhouse (rebuilt 1645), an endowed institution for the poor, are the most worthy of note. There are three prettily laid out public parks. A town-hall, Italian Renaissance in style, was opened in 1866, as also was a new exchange. There are also a spacious gaol (1869), a new post-office (1877), the Theatre Royal (1873),

the dock-office (1871), public baths (1850), a new market-hall (1887), and the James Reckitt Free Library (1889).

The docks and basins, comprising an area of upwards of 200 acres, have been constructed since 1774. The Victoria Dock (1850–64) covers 20 acres, exclusive of two large timber ponds and tidal basins which contain an area of about 9 acres; it partly occupies the site of an old citadel with a battery of twenty-one guns, which till 1864 commanded the entrance of Hull Roads and the Humber. The Albert Dock (24½ acres) was opened in 1869; and the Alexandra Dock (40 acres) in 1883, on the same day as the Hull and Barnsley Railway. Hull was one of the first ports in England to engage in the whale-fishery, an enterprise which has been abandoned; but its fisheries for edible fish employ, in conjunction with those of Grimsby, large fleets of boats, attended by steam auxiliaries. Hull is a principal steam-packet station, and ocean-steamers ply regularly to many of the principal ports of Belgium, Holland, Denmark, Russia, Germany, and Scandinavia. Its home trade is also very extensive. It is the great outlet for the woollen and cotton goods of the midland counties, with which it has direct communication, by means of railway, river, or canal. It is the chief entrepôt for German and Scandinavian oversea trade. There is also regular steam communication with New York and Boston; and an Australian trade and a very important trade with India have been inaugurated. Hull ranks third among British ports, the average yearly value of its imports exceeding £20,000,000, of its exports £16,000,000. From its geographical position it is confidently believed that, even were the interior of the country canalised as far as Leeds, the port at the mouth of the Humber would continue to maintain the position of third entrepôt of the kingdom. Shipbuilding yards are in operation; and, in addition to iron ships, important ironclads have been built here for British and several foreign governments. The chief manufactures are those principally to which a flourishing port gives rise, as ropes, canvas, chain, chain-cables, machinery, &c. Many mills of various kinds are carried on, as well as chemical factories, tanneries, and sugar-refineries. Seed-crushing for oil is also an important staple industry, in which a large amount of capital is invested. Constituted the free borough of Kingston-on-Hull by Edward I. in 1299, the town owed much to its great merchant-house, the De la Poles, whose head, Michael, in 1385 was created Earl of Suffolk. In 1642 the refusal of its governor, Sir John Hotham, to admit Charles within its walls marked the outbreak of the Civil War, during which Hull was twice besieged by the royalists. It was made the seat of a suffragan bishop in 1534, and again in 1891. Since 1885 Hull has returned three instead of two members to parliament. The Hymers Library was given to the town in 1893, in which year there was a great dockers strike, with riots and incendiary fires in timber yards. Pop. (1851) 84,690; (1881) 165,690; (1891) 199,991.

See local works by Gent (1735; new ed. 1869), Frost (1827), Symons (1862), Sheahan (1864), and Tindall Wildridge (1888); also Freeman's *English Towns* (1883).

Hull, the chief town of Ottawa county, Quebec, is on the Ottawa River, opposite Ottawa (q.v.), with which it is connected by a suspension bridge. It was almost wholly burnt down in April 1900. Pop. (1881) 6890; (1891) 11,264.

Hull, WILLIAM, general, was born at Derby, Connecticut, in 1753, fought in the war of independence, and governed Michigan territory in 1805–12. In 1812 he was sent with an ill-found army of 1500 men to defend Detroit; there he was left without supplies, shut in by British and Indians, and ultimately compelled to surrender. The government needed a scapegoat, and Hull was tried by court-martial and sentenced to be shot. The sentence, however, was never carried out, and he died on his farm at Newton, Massachusetts, in 1825.

His nephew, ISAAC HULL, naval officer, was born at Derby, Connecticut, 9th March 1773, became a cabin-boy at fourteen, rose to the command of a ship in the West Indian trade, and in 1798 entered the newly-established American navy as a fourth-lieutenant. He was appointed to the *Constitution* frigate, which he commanded as captain from 1806. Hull was an able seaman, and in July 1812 his skill in sailing his ship enabled him to escape from an English squadron, after a pursuit of three days and nights. On August 19 of the same year he captured the British frigate *Guerriere*, forty-four guns, after a close action of thirty minutes; the *Constitution* losing fourteen killed and wounded, the *Guerriere* seventy-nine. The *Guerriere* was so injured that she had to be burned; while Hull's frigate escaped with such slight damage as to gain for her the name of 'Old Ironsides.' Hull received a medal from congress, swords of honour, and the freedom of several cities. He afterwards commanded squadrons in the Mediterranean and Pacific, retired in 1841, and died in Philadelphia, 13th February 1843. See the Life by General James Grant Wilson (New York, 1889).

Hullah, JOHN PYKE, the pioneer of music for the people, was born at Worcester, 27th June 1812. He studied at the Royal Academy of Music, and in 1836 composed *The Village Coquettes* to Charles Dickens's libretto. In 1840 he began popular singing-classes in Exeter Hall, London, in which, during a course of twenty years' teaching, he trained thousands to use their voice in singing. He was for several years professor of Vocal Music in King's College, and taught at other schools and colleges in the metropolis; and from 1874 to 1882 was appointed inspector of training-schools for the United Kingdom. Hullah, who followed a modification of Wilhem's system, had little sympathy with recent developments of modern music, and opposed the 'Tonic Sol-fa' method. He published amongst other works a *History of Modern Music* (1862) and *The Third Period of Musical History* (1865). Of his songs, 'The Three Fishers' and 'The Storm' attained wide popularity. He died in London, 21st February 1884. See the Life by his wife (1886).

Hulsean Lectures, &c. The Rev. John Hulse, born at Middlewich, Cheshire, in 1708, educated at St John's College, Cambridge, and died in 1789, bequeathed his property to the university, for the founding of two divinity scholarships in St John's College, the Hulsean Prize, the office of Christian Advocate (in 1860 changed into the Hulsean Professorship of Divinity), and that of Hulsean Lecturer or Christian Preacher. The lecturer, appointed annually, must deliver at least four lectures before the university, although the number required was originally twenty, afterwards reduced to eight, and since 1860 to four. The subjects are 'the Evidence for Revealed Religion; the Truth and Excellence of Christianity; Prophecies and Miracles; Direct or Collateral Proofs of the Christian Religion, especially the Collateral Arguments; the most difficult Texts or Obscure Parts of Holy Scripture.' Among the lecturers have been Trench, Christopher Wordsworth, Ellicott, Dean Howson, Farrar, Dr E. A. Abbott, and Bishop Boyd Carpenter.

Humane Society, THE, was formed in 1774 by Dr Hawes and Dr Cogan and thirty-two others,

in London, for the purpose of resuscitating those who had been immersed in water and were apparently drowned. At the present time it distributes rewards, consisting of medals, clasps, testimonials, and sums of money, to those who save or attempt to save life from drowning. Also 'all cases of exceptional bravery in rescuing or attempting to rescue persons from asphyxia in mines, wells, blast furnaces, or in sewers where foul gas may endanger life, are recognisable by the society.' It likewise gives prizes for swimming to the pupils of public schools and of training-ships. Boats and boatmen

Medal of the Royal Humane Society
(actual size 1½ inch diameter).

are kept on the Serpentine in Hyde Park for the purpose of watching over the bathers who resort thither. And during the skating season experienced icemen are sent to the various waters in and around London to help in case of accidents. The society is supported by bequests and private subscriptions. Since 1873 the Stanhope gold medal has been awarded 'to the case exhibiting greatest gallantry during the year.' In 1889 more than five hundred rewards were distributed, one hundred more than in any other year since the foundation of the society. The figure shows the medal of the society. Another reverse is used when it is presented to persons who have risked their lives to save others, but without success; the inscription is 'VITA PERICULO EXPOSITA DONO DEDIT SOCIETAS REGIA HUMANA.' See *Annual Report of the Royal Humane Society* (4 Trafalgar Square, W.C.).

Humanists (Lat. *literæ humaniores*, 'polite letters'—whence the title *Humanity* for the professorship of Latin in Scottish universities; Ital. *umanista*), the name assumed at the revival of learning by those who looked upon the cultivation of classical literature as the most valuable instrument of education, in opposition to those who clung to the ancient methods of the Scholastics (q.v.). In their modes of thought also the tendency of the humanists was to exalt Paganism at the expense of Christianity. In the 18th century the name became a word of reproach for those who showed a blind zeal for the classics as the sole educational subject, opposing the Philanthropists, who asserted the value of mathematics, science, modern languages, and history. The name is often given to the foremost representatives of classical learning from the time of the Renaissance (q.v.) onwards, such as Erasmus, Sir Thomas More, Ulrich von Hutten, George Buchanan, &c.

Humanitarians, a name assigned to anti Trinitarians, who regard Christ as a mere man, and refuse to ascribe to him any supernatural character, whether of origin or of nature (see UNITARIANS). The name Humanitarian is also sometimes applied to the disciples of St Simon, and in general to those who look to the perfectibility of human nature as their great moral and social dogma; also to those who, from over-philanthropy, object to severe measures, such as capital punishment, &c. For the religion of Humanity, see POSITIVISM.

END OF VOL. V.

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